Woodburytype.

A. RUFFO, SCALETTA, ROME.

ST. ROSALIA—VIRGIN AND MARTYR.

THE

PHOTOGRAPHIC QUARTERLY.

October 1891, to July 1892.

London:

HAZELL, WATSON, [illegible]

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THE

PHOTOGRAPHIC QUARTERLY.

VOL. III. No. 9.—OCTOBER 1891.

THE TRANSITION PERIOD.

PHOTOGRAPHERS may be surprised and shocked to be told that we have now arrived at a period when everything connected with the art has almost come to a standstill; yet this would not be very difficult of proof. To do so decisively and clearly would take a further excursion into ancient history than would be palatable at present, but although, unlike Fadladeen in "Lalla Rookh," it may not be necessary to take a review of all the stories ever told in order to notice a short poem, it may be convenient to refer occasionally to those unknown times to which the memory or reading of the modern amateur does not extend.

At the present time, surveying the art "from China to Peru," what do we find? Leaving out a dozen or twenty enthusiastic workers, we find a dead level of half-plate-itude tempered with snap-shotism; for that is what we have come to. We have fallen upon easy times, and are becoming effeminate, with the usual result. When photography was really difficult and kept men awake o' nights, and removed their coats by day, a photographer would take his barrow, or his perambulator, or the more aristocratic van, and in spite of all difficulties, or rather because of them, would do noble work. He had to give all he knew to the work; he had to know what he was doing to begin with, which does not always seem necessary now. He had the distraction of hard manual labour; he had even to bear partial suffocation in the cause, as those who, desiring to try the experiment, will easily prove by

shutting themselves up with the temperature at 80°, in a tent 4 feet square, and coating a 15×12 with collodion. Under these circumstances, a man was bound to do good work; considering the trouble he had to take, he could not afford to do otherwise; but now a photographer is content to take out his ½- or ¼-plate camera for an hour and fire away. He knows the worst—a few shillings in plates; and if there should happen a good picture among them, well, it is all to the good, and shall have its chance of a cheap medal.

Notwithstanding its greatly increased practice, photography is not so much loved for its own sake as it used to be. Although there has been much talk about art of late, an interest, however, which has not permeated the masses, photographs are not looked at by the public, or even by its followers, in the same way as paintings or even engravings. Exhibitions are indeed extensively patronised, but who now cares to collect the best specimens of the best masters? I remember the time—a time when the art was not practised to a thousandth part of the extent it is in these later days—when every amateur possessed his portfolio of choice photographs, and, moreover, cherished them for the art they displayed and the lessons they taught. You could not enter the house of any enthusiastic photographer, without finding perhaps a choice Rejlander on the walls, or a Le Gray, or a Francis Bedford, or a Fenton, of which the owner was proud. And these were the benighted times when, according to modern prophets, art was absent! Now what do we see in every house, for every house holds its amateur? You find the walls covered with photographs, it is true, but they are the amateurs' own; they are interesting to him because they are his own, and they fill so much space that he has not room, neither does he care, to admit any higher efforts that may clash with his own. Indeed the biggest white elephant you can give to an amateur is a fine photograph; he does not know what to do with it. I confess that I sympathise with him to some extent, and delight in covering my bedroom walls with what may be called domestic photographs, but I enjoy the selected works of others better than my own; and

nothing gives me greater pleasure than turning over a folio of old masterpieces which show that there were giants even in those early days. On the other hand, what is a photographer to do with all the little photographs that are sent him nowadays? There is nothing for it but the waste-paper basket or the hospital, and even that leads to embarrassment when you get a letter beginning, "Referring to a photograph I sent you three months ago," or "You remember that lovely subject (of a cattle shed with a corrugated iron roof), of which I sent you a $\frac{1}{4}$-plate, hoping to induce you to bring your large camera," etc.

And so the photographic world stagnates. We have arrived at a dead level, and among a thousand amateur photographs there is scarcely a pin to choose. In saying this, I do not forget that we have some amateurs who have individuality and ambition, and whose work is eagerly looked for at the early exhibitions. I say "early" advisedly, for they soon get knocked out of the other exhibitions by the injurious handicapping rules which now prevail, and the world sees them no more. But what is the number of these amateurs? Are there a dozen of them? I am afraid not. And what proportion would they bear to the enormous number of those who use the camera? We should have to go a long way into decimals to find the percentage.

When things fall to their lowest, they must rise or die. The situation is not without hope. There is plenty of vitality still left in photography, but it is latent. The worship of the commonplace, the domestic, and "my own," will decrease as the amateur begins to see what there is in photography, and is only conspicuous now because of the almost overwhelming rush of amateurs during the last ten years. Many die out, some care for nothing but the easy and obvious, but a large remainder will take as much interest in the art for itself as for their own little corner of it. The portraits of relations, however poor (the photographs, I mean), will always be retained, and rightly; so also will the domestic scenery, the house where he was born, the village church where he was married, and the never-to-be-forgotten watering-place where the

honeymoon was spent; but the very indifferent $\frac{1}{2}$-plates of badly selected views will go. The amateur, as he improves, will have more faith in his own skill, and not be afraid of hanging a stranger photograph within shouting distance. In time, he will become a collector, not only of the current work of the day, but of the old masters, and—who knows?—we may live to see Mr. Stevens preside over the sale of a rare photograph which may attract collectors from all parts of the earth and fetch as much as a Rembrandt etching.

"And when the happy time comes round, may we be there to see," as the song says. The decadence was of yesterday, the revival may begin to-morrow. But while we are waiting, art photographs are sold by the foot, because there is not a sufficiently small coin of the realm to estimate them by the inch. I am shocked to have to say it, but before much improvement sets in we must become honest.

At present, there is not a sufficiently proper moral feeling concerning photography; nor, indeed, any elevating sense that anything of the sort is required. Here is a typical instance. I have been advocating lately, rather more strongly than usual, that in exhibitions the exhibits shall be by the exhibitor, a proposition that one would think was obviously proper and just; and I was met by one who has had much to do with exhibitions, and, moreover, is a man strictly honourable in ordinary matters, saying, "Oh, we want the pictures, and don't care who they are by!" A remark that seemed to me to be a little out of tone; but it is, unfortunately, of a piece with a great deal that is wrong just at present in photography.

As long as this kind of feeling prevails, how can we expect the art to be respected? It is this low estimate of the art, and of its individuality, that makes it still possible for painters and etchers to write to you unblushingly for cheap lots of your spoilt prints; because, as one of them says in a letter now before me, "they would be useful to me for artistic purposes. I sometimes want some figures, and as I have not done so much in figure-drawing, I

sometimes want some suggestions for that line of work." Yes, it is the "suggestion" they want; as if this quality was not the same, and did not present the same kind of difficulty, in all art. Yet the man who would rob the photographer of his ideas without compunction, would feel the awful guilt of stealing a line from the work of a painter or draughtsman. There is also another curious anomaly here. Artists will call the camera a senseless machine at one moment, and appropriate the ideas embodied by its agency the next. It is this feeling that induces the dealer to call your choicest works "scraps," and to expect that all photographs, whatever their quality, shall be the same price according to size.

The same feeling, or something like it, crops up in unexpected places. There was an exhibition this year on the continent which really promised to be all that was desirable. It was distinctly an art exhibition of photographs. It was almost overwhelmed with illustrious patrons; there was a jury of admission composed of distinguished artists; there were medals promised; the admission was strictly limited, and the proportion of rejected to accepted was almost as great as at our own Royal Academy. This was all very satisfactory; and photographers thought their art had at last met with due recognition. But with the catalogue the disillusion came. With it was enclosed an application which showed the real appreciation of the value of your work. It was, in short, considered good enough to give away or sell cheaply. It was pointed out that it would be a flattering recognition of their merits to allow the exhibitors to contribute prints to several collections to be presented to illustrious patrons and institutions. This suggestion was qualified, it is true, by an inquiry as to what remuneration would be required, but this was spoilt by the addition in one of the applications of the words "if any." The promised medals were not awarded, for the astounding reason that all the photographs were too good. It was evidently a puzzle to this remarkably artistic jury to select the best.

The intentions of the promoters of this exhibition were evidently of the very best, but they broke down in a weak place. This was

an exaggerated notion as to the value of great names, either as patrons or as judges. There is no doubt a value in these things, but they may be made too much of.

I mention all this to show that the impression of the world is that photographs have no value, or to estimate them at the cost of the material used. If our work is to be estimated as art, it should be valued in a manner corresponding to that placed on kindred art. Whoever asked Meissonier or Millais to supply pictures to present to illustrious patrons at the cost of the canvas and paint, with perhaps a little for the man's time laying it on ?

The appreciation of photography has fallen so low as to seem hopeless of remedy, but I cannot help thinking it will rise again. It is said that Heaven helps those who help themselves; and we must help ourselves. The exhibitions could do somewhat, especially if they could become indifferent to gate-money and the necessity of pleasing their members. The exhibits should be what they are represented to be. The spectator should be quite certain that the exhibited picture expresses the mind of the exhibitor, and that he did not buy the produce of any other mind, in any way, for the purposes of exhibition. I don't care whether it is the production of the master or the man, but let us know which, and avoid degrading false pretences and artistic frauds.

The standard of excellence for admission should be raised, and good work should not be strangled because it *is* good, soon after its birth, as now happens. As soon as a photograph gets a medal a black mark is set against it, and it is only allowed to feebly breathe in champion classes. This is a direct encouragement of the mediocre work that has brought us to the present dead level. Then, again, it would be well to increase the size of exhibits. We are not so peculiarly susceptible to the sentiment of emulation in magnitude as they are in America, but some respect should be paid to mere size. Although I believe a good deal of art can be packed into little space, like a great soul in a small body, the experiment may be tried of raising the limit of size in exhibited photographs—say nothing below 8 × 6. There is a precedent

for this if one is wanted. Many years ago cartes-de-visite were barred at exhibitions with most salutary effect.

But after all the apparent decadence is not caused by outside influence, so much as by the photographer not taking a proper pride in his art for itself. All would be well if, instead of producing rubbish in quantity, he would prepare for exhibition in size and quality. Let him take a pride in what the art can do as well as what he can do himself; let him collect choice examples, and become learned in the history of the art, and he may save himself the reproach of being tired of photographs if he is not of photography.

The purpose of this paper is not to condemn the art, the practice of which I have followed for so many pleasant years. I have no grievance to make me suddenly discover that photography is not an art; and if I think that, notwithstanding the vast numbers who dabble in the art, it is not followed as earnestly as formerly, I still have a profound faith in photography, and my object in this rather pessimistic paper, is to rouse up its followers to take more interest in the art for itself, to show more often its utmost capabilities, and to do as good work as they would certainly do if their latent powers were properly developed by its practice being more difficult.

H. P. Robinson.

PHOTOGRAPHY AND RESEARCH.

A great problem, ever pressing upon mankind,
Is, how to discover and apply
The immense Universe of Truth yet unknown;
Thus to understand the great cause of all things,
And harmonise our actions with it. And thus
The final end of all original research
Is the improvement and perfection of mankind.*

IT is beyond all dispute that the basis of human progress lies in scientific discovery. Bearing this fact in mind the highest aim of every follower of science is, or at any rate should be, the discovery of new truth. His work should always be carried out with the hope that some glimpse of the unknown may result from his labours. Every new truth discovered, no matter how unimportant and insignificant it may at first appear, strengthens our position in the world, increases our wealth as a nation, and adds to our individual happiness. No one is able to judge of the ultimate usefulness, or otherwise, of a discovery on its first being made known, as its application may be impossible at the time. Its ultimate usefulness may be dependent upon some further discovery, or upon certain conditions which may not at the time exist. For instance, when it was first discovered that nitrate of silver blackened by the action of light, who could have foreseen that, as the result of this seemingly small and unimportant bit of new knowledge, a great art-science like that of photography would arise. This discovery has benefited, more or less, the whole human race. Thousands of persons obtain their living through it directly, and hundreds of thousands indirectly. Yet, on this

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* "The Art of Scientific Discovery" (G. Gore).

fact being made known, it must have appeared to have been of very little importance.

Many discoveries now known to us are seemingly of little or no value; but in the dim future, when the time for their application is ripe, these small fragments of truth may form the foundation stones of immense industries.

Knowing what has occurred in the past, and what may occur in the future, it behoves us all (I am now especially addressing photographers) to use every effort to discover new truths, and to apply those already known. In no other art have so many discoveries and rediscoveries been made as in photography. Yet, even although more persons are engaged in its pursuit than in any other science, many of the most important facts relating to its theory and practice remain undiscovered.

As examples of important facts relating to photography which have yet to be discovered I may mention that at present we have no satisfactory theory of the formation and reversal of the latent image; and that, although it was as far back as the year 1777 when Scheele discovered that chloride of silver was decomposed by white light, chemists are not agreed at the present time as to whether the black residue is metallic silver or a subchloride of that metal.

There is no reason, as far as we can see, why these problems should not be solved. It may be, however, that discoveries will have to be made in sciences not directly connected with photography, before the conditions necessary for the elucidation of these questions can be applied. Discoveries can only be made at a prescribed rate, and must follow one another in sequence. The discovery of a new fact in our branch of science often paves the way for research in others, which may, under these new conditions, deliver up their secrets. Thus the discovery of new chemical compounds places in the hands of photographers additional power for experiment. The basis of future discovery is founded upon knowledge already gained. Hence it is absolutely necessary that one should know all that is known about a subject

before one is in a position to search for new truths concerning it. In these days, when every necessary to the photographer can be obtained ready prepared for use, it is often considered quite unnecessary to understand anything of the scientific portion of our art, and I have often been astonished to find some of those regarded as among our best men (by this I mean men who have gained medals at our exhibitions, and whose names are known amongst the craft) perfectly ignorant of the chemical actions which take place during the processes which they employ. There are openings for further investigation in every branch of photography, and if our workers would only place themselves in a position to note, value and appreciate new facts, our knowledge of the subject would advance more rapidly. It may be asked: How are we to place ourselves in such a position?

In the first place, by reading up the literature of the subject, which so far is not very extensive. Secondly, by becoming familiar with the various steps by which our art has risen from the cradle to its present position. Thirdly, by repeating the experiments of others, under new conditions if possible; and finally, by training our perceptive faculties so as to be able to appreciate new facts when we meet with them. One of the most fruitful methods of research is the repetition of experiments done by others. The action of light upon various chemical compounds offers an almost inexhaustible mine for further investigation, and a repetition of the experiments of Nièpce, Wedgwood, Herschel, and others, under the new conditions which exist by virtue of our advanced knowledge, could hardly fail in the discovery of new facts.

Of course, we cannot all be scientific investigators, for these, like poets and artists, are born and not made. The power to discover new truths is intuitive, and although a special training is necessary, training alone will never make an investigator. "One of the most important qualifications of a scientific discoverer, viz., rapid scientific insight, depends essentially upon the possession of extensive knowledge, and especially upon a know-

ledge of great scientific principles and their relation to each other."*

All photographers can, however, help in the search for truth if, when they find some new fact (no matter how seemingly trivial), they will take the first opportunity to make it widely known, through the medium of the various papers devoted to the subject, where it may meet the eye of some one whose scientific insight is keener than theirs, and whose deductive faculties are better trained. Collective investigation is next to useless, as the sources of error which always impede scientific progress are multiplied to such an extent as to render such works abortive; but the publication of facts alone is a source of much knowledge, and may be of great use to men engaged in research.

Photography numbers in the ranks of its followers very few scientific investigators, but the number of inventors following its pursuit is legion. These two callings are very frequently confounded, and there exists much misconception as to the nature of pure research. An investigator's work is the finding of new truths; an inventor's, the application of such truths to some desired purpose: hence without the former the latter could not exist. A discoverer rarely applies new truth, and perhaps this is the reason why we have so few of them, and as they reap no pecuniary benefit from their labours, they must of necessity have both time and money at their disposal. Inventors and manufacturers, on the other hand, frequently make very large fortunes; they therefore are the men who should be called upon to contribute towards the cost of future investigations. I trust that the time is not far distant when we shall have a Royal Photographic Society, based on the lines of the other royal scientific societies, which will have the right to confer distinctions upon eminent photographic investigators, and which will be endowed with funds sufficiently large to enable them to make grants (when required) for pure research.

* "The Art of Scientific Discovery" (G. Gore).

Apart from investigation in the art-science of photography itself, photography in its present condition, when used as an instrument of research in other sciences, is one of the greatest powers ever placed in the hands of the scientific inquirer. There is hardly a branch of science which cannot be helped by it. It can be applied with distinct gain to astronomy, geology, botany, microscopy in all its branches, physics, chemistry, medicine, surgery, and many others. Many discoveries in other sciences have been made with its aid, which could not have been made without it.

In the study of astronomy it has worked wonders, and followers of this branch of science are fully awake to the manifold advantages likely to arise from its further judicious application. Dr. Huggins, President of the British Association, in his masterly address delivered a few weeks ago at Cardiff, spoke in most glowing terms of the invaluable aid it had furnished in some of the applications of the spectroscope to the heavenly bodies. He said that the new power which modern photography has put into the hands of the astronomer is so great, and has already led, within the last few years, to new acquisitions of knowledge of such vast importance, that he felt obliged to devote some time to the discussion of the subject. It enables the astronomer, within the comparatively short time of a single exposure, to secure, permanently and with great exactness, the relative positions of hundreds, or even of thousands, of stars. It enables work to be done, which by means of the hand and eye would take years to accomplish, in a comparatively short time. Again, the sensitive plate will record light-waves which cannot be detected with the eye; hence discoveries are made which could not be found out without its aid. This fact alone, that it is possible to impress upon the film an image which is invisible to the eye, is sufficient in itself to point to its future utility to astronomers and microscopists. The position and presence of hundreds of new stars has been made known by its aid. It has done, and will do, more to increase our knowledge of the heavenly bodies, than any other

branch of science. With the aid of the micro-spectroscope, Professor Pickering, in America, has done some good work. At the end of the year 1888 he had already 27,953 negatives of the spectra of stars, beside many enlargements of the spectra of the more brilliant ones. Dr. Vogel, of Potsdam, during the same year, obtained some most satisfactory determinations of the motion of stars in the line of sight, and these have been considerably augmented since that date. Professor Pritchard has added a number of new stars to the list of those whose distance from the earth he had previously calculated from measurements of his photographs. These few examples of the good work done, must suffice to prove the great value of photography as an instrument of research in the study of astronomy.

In the hands of the microscopist it is, however, equally useful, and although few discoveries can be said to have been the direct outcome of its application, it has given great help in many investigations, and will undoubtedly give much more in the future. During the last few years discoveries have been made, which will render the practice of photo-micrography considerably easier than it has been in the past. A new era in this important branch of photography has been initiated by the production of improved objectives. Carl Zeiss, of Jena, has perfected, from the formula of Dr. Abbe, an apochromatic objective which for numerical aperture surpasses any previously made. With this objective some very good work has been done. Mr. Andrew Pringle has succeeded in taking some beautiful photographs of micro-organisms. Dr. Henri Van Heurck, of Antwerp, has produced some remarkable photographs of the most difficult test diatoms. Dr. Maddox, Dr. Dallinger, Professor Watson Cheyne, Dr. J. Sims Woodhead, and others, have also succeeded in advancing knowledge upon various branches of microscopical science by the aid of photography. The author has in his possession a most beautiful series of photographs of the pathology of tubercle, which were used to illustrate Professor Watson Cheyne's lectures upon that subject before the Royal College of Surgeons. Mr. Andrew Pringle has

succeeded in photographing the flagellum of B. Termo. Dr. Dallinger has calculated that the diameter of this flagellum is $\frac{1}{200000}$ inch. The photographs were taken with Zeiss's apochromatic objectives of 2 and 1·5 millimetres focal length. The vast unexplored field which photo-micrography offers, should always give this branch of our art a premier position with those of its followers whose aim it is to produce something new.

In the domain of physical science photography has proved itself to be of the greatest use as an instrument of research. Photographic registering instruments are now largely used for noting the variations of the barometer, thermometer, the oscillations of the magnetic needle, and the movements of other pieces of registering apparatus. Registration by means of photography offers many and distinct advantages. It does away with some of the complicated mechanism which is required by other methods; it is simple, truthful, and enables observations to be carried on over a considerable length of time, with very little attention from the investigator, who is thus left free to carry on other work, instead of having to make hourly or even half-hourly excursions to his instrument.

The self-registering photographic thermograph and barometrograph have both proved to be useful and reliable instruments. The photometer, an instrument used for measuring the intensity of rays of light emanating from different sources, has been found useful in making comparisons of the intensity of the luminous rays emanating from the sun, moon, and stars, as well as for measuring the actinic value of the light given by the burning of the different oils, gases, etc., which are used for lighting purposes. Photography has been used to depict the phenomena of the interference and diffraction of light.

Instantaneous photography has been used to measure the velocity of projectiles, and to calculate the projective force obtained from explosives. Mr. Boys has used it to delineate the various shapes assumed by falling drops of rain and other fluids, also to demonstrate the various phenomena exhibited by soap

films. It has also been used for testing the speeds of the electric spark; and a continuation of experiments in this direction will undoubtedly lead to the discovery of more accurate means of measuring short periods of time.

The great advantages which it offers to the chemist and natural philosopher, in the study of the spectrum, are well known, many discoveries having been due to its application.

The application of photography to medicine, surgery, and the allied sciences, is a great aid to the alleviation of the sufferings of mankind. Illustrations made by its means further truth and propagate scientific knowledge. Many of our able medical scientific inquirers have spent their lives and fortunes in disseminating by means of illustrations the accumulated knowledge of a lifetime spent religiously in investigation. Hunter's collection of drawings of various pathological conditions must have cost thousands of pounds; but thanks to the enormous strides made in photography, and the reproduction of photographs by mechanical processes, every observer is capable (if he only take the trouble) of recording for the benefit of others the clinical and pathological aspect of diseases, with an amount of accuracy and faithfulness which no drawing could ever attain to. Thousands of cases of scientific interest are annually lost and forgotten, when, had they been photographed, a permanent and reliable record of them could have been obtained. Such photographs, accompanied with carefully composed notes, are of infinite value to an investigator, who, by this means, is enabled to draw his conclusions from a number of sources which, during the short space of a single life, would otherwise be impossible.

By the aid of photography we are enabled to produce a faithful transcript of any image reflected upon the sensitive plate within the space of a few minutes. The flash-light has placed additional power in our hands in this respect, as by its aid we can produce pictures under conditions which were before impossible. Operations in the course of performance can be taken in this way; and interesting cases can be reproduced whilst they are being exhibited

before the various medical societies. To truthfully depict pathological and clinical appearances the illustrations must be coloured. Here again photography has come to our assistance, and we are now able by its aid to copy drawings on zinc blocks, and print them with innumerable colours, thus getting exact facsimiles of the original drawings by purely mechanical means. The amount of material for investigation which is wasted in our large hospitals is little short of a disgrace. Every institution of this kind should be provided with a studio and dark room, and every case which is capable of teaching anything should be photographed. As a means of giving further stimulus to work in this important branch of art-science, I would urge that the British Medical Association should add a photographic section to their animal museum, and that they should offer prizes for proficiency in the various branches of medical photography.

There is hardly a branch of science which cannot receive some aid from photography; but I think I have said sufficient to prove its usefulness as an instrument of research.

As photography itself progresses step by step its usefulness increases, and it becomes a greater power in the hands of the investigator. There is no doubt but that verifiable truth is seriously neglected, and the main object of this paper is to draw the attention of photographers to this important fact, in the hope that some one will be led to embark on a voyage of discovery in one of the numerous branches of this important art-science. Scientific investigations, of course, cost money, and many are debarred from research from this cause. Whilst millions of pounds are annually spent in this country in the support of dogmas and doctrines, and in the making of experiments in death-dealing instruments, very few thousands are spent in the encouragement of pure scientific research. This is very much to be regretted, as it shows that the good which arises from increased knowledge is not fully appreciated. We have lately heard a great deal about the responsibilities of wealth, and it is surprising that, so far, no wealthy philanthropic individual has seen that, in the

endowment of institutions for pure research, he would be doing as much towards ameliorating the condition of mankind, and reducing the amount of human misery, as he would do by flooding the country with hospitals and asylums.

The work of encouraging research is generally left to our scientific societies, and I should like to see our photographic clubs doing more in this respect. Very few of them have funds sufficiently large to make grants for this purpose, but they might do much by offering the best prizes for original investigation, and by encouraging their members to work with some definite object in view.

J. Hall-Edwards.

CHOICE AND TREATMENT OF SUBJECTS.

BEING somewhat of an artist by profession, and by inclination an inveterate rambler, it constantly happens, at times when sketching is impracticable, that I see picturesque bits in strange places, some memoranda of which I long to possess. But, and the remark is trite, there is so much to do, and so little time given us to do it. To always carry a camera, with tripod ready set up, is, naturally, out of the question; so in spite of the disfavour with which hand cameras are regarded, it would seem that they are really, in these circumstances, the only things to fall back upon.

My first companion of this kind was a ¼-plate size, with a 4½-in. focus lens, a finder, and a changing box. After studying its capabilities and limitations, and taking it out pretty often, I found it to answer very well for certain classes of subject viewed from a particular distance. The sheep, for example, in illustration opposite, were taken with about half a second's exposure on a cold morning last May, and without further steadying for the camera than was afforded by my umbrella. Where the principal objects are fairly on one plane, at from 10 to 12 paces distant, this little camera, which is extremely light and convenient, answers very well. The next illustration also was done with it, the rest being a stake in a hedge, the exposure about two seconds.

But it has drawbacks. The unnaturally forced perspective seen, for instance, in the too rapid convergence of parallel lines that run into the picture, soon becomes distasteful; the distortion in many cases being past bearing. It soon became apparent to me that something better must be found, and having a 9-in. focus ½-plate lens to spare, I had it adapted to a hand camera measuring 12½ inches long, by 4⅜ broad, and 5⅜ deep. This lens

has an iris diaphragm; there are two finders to the camera, which being made of thin pine is very light. Accompanying it are two changing boxes, carrying half-a-dozen plates each; the focus can be altered, should that be found necessary, and it is altogether a most serviceable instrument. It may be well to mention that having rapid plates in one changing box, and ordinary ones in the other, snap shots at moving objects or time exposures may be

AT RADFORD, LEAMINGTON.
(4½-inch lens. No rest used.)

tried, according to light or subject. Moreover if one chooses to carry an extra half-dozen of plates, ready done up in their frames, it is not difficult to change them, for those already exposed, in any room free from sunlight, by drawing blinds and curtains, and conducting the operation by touch under a table-cover or coat. For changing in my bedroom at night, when travelling, I carry a piece of ruby cloth medium, 12 × 20, which, with ends pinned together, stands up, cylinder-like, leaving room for a bedroom

candlestick to safely stand inside. To avoid reflected light from the ceiling, though I am not certain that that is of consequence, the candle may be put under a washstand or table. To be quite sure of one's plates, it is always good policy to keep them as far as may be from any light.

As to development, in my experience it can rarely be done with comfort away from one's own dark room. Just lately, in a

NEAR DUNCHURCH.
(*4½-inch lens.*)

provincial town, I tried a dark room kept by a chemist, who is, moreover, honorary secretary to the amateur photographic society of the place. The lamp given me to work with was of a kind that I have since seen condemned, and as the place was frequented by amateurs both good and bad, there was no telling what had last been put in dishes and measures. Development there was an experiment often resulting in dismal failure, though similar plates, similarly exposed, turned out afterwards very well at home. If

it is necessary to try a plate or two in a strange place the best plan is to employ the local professional. It is safer, more convenient, and costs but a trifle. Quarter-plates are, however, so cheap, that, for my own part, I prefer to expose two or three on any good subject far from home, reckoning on securing at least one success out of the number.

Much depends on the object one has in view. My own

AT TINGEWICK, BUCKS.
(*$4\frac{1}{4}$-inch lens. No rest.*)

particular aim is to get picturesque bits for my scrap-books, which are not merely pleasant souvenirs of places visited, but are full of suggestion and useful detail and aid for other work. Every one knows also that a good $\frac{1}{4}$-plate negative will afford good enlargements. Before quitting the short camera it may be well to refer to an illustration of its forced perspective in some horses ploughing at Tingewick, Bucks.

To resume, then, no one who cares for truth of proportion will

use a lens of less than 9-in. focus, for, in comparison with the improvement in result obtainable, a little drawback of extra length in the camera is not worth mention.

Some kind of a rest is, however, frequently necessary; a camp-stool is handy, and often suffices. One looks down with comfort on the finders, arranging the field of view to a nicety; *à propos* of which point, it may be useful to mention that at Newlyn, not long ago, I wanted to take a group of men at work at ship carpentry on the pier. These, as soon as they saw the camera, became interested in my doings, and, as people always do on these occasions, began unconsciously to pose. I then carefully avoided giving them a glance, except in the finder, but looked often and intently at a fishing-boat a little on one side the line of sight in the harbour. This soon put them off; they resumed work, and I had my "snap." A camp-stool is, unfortunately, sometimes too low, so there can be no doubt that a very light tripod stand is a great advantage, when one does not mind carrying it. For use with such a stand a finder has been fitted to my camera, which is itself, in fact, a very small camera, with a lens of $4\frac{1}{2}$-in. focus. The ground glass is sufficiently covered to render a focussing cloth unnecessary, and serves indifferently for oblongs or uprights. It measures $2\frac{1}{8}$-in. by $1\frac{5}{8}$-in., the picture on it coinciding perfectly with that in the camera, and being so clear as to furnish me with another strong inducement to use this instrument in preference to any other. The view, on opposite page, in Stoneleigh Park was taken with it, aided by a stand.

With such an instrument any kind of work from portraiture to mountain scenery, or wave studies, may be tackled. I am at present engaged in laying up a store of plates exposed in it, for development in winter evenings, experience having taught me that an occupation requiring so much time and patience is best suited for long nights when one is often at a loss for something to do. It is an exquisite pleasure to recognise, as they gradually appear on the gelatine, scenes that have been admired months before, hundreds of miles away. How great a

reserve of enjoyment for dull seasons the photographer may prepare for himself, with little trouble and less cost!

Now, as to "choice of subject," it may be at once remarked that there are few subjects that are not pictorial, and therefore worth photographing, given certain favouring attendant circumstances, such as relation of the parts to each other, and appropriate light and shade. The oft-quoted illustration of the wayside

STONELEIGH PARK.
(9-inch lens.)

flower is strictly true. We often pass it, unnoticing, but, stooping, we find it graceful in line, and interesting in detail; full, in fact, of beauty. A building may be ugly near, yet look well from afar. At midday, when photographers most delight in their work, shadows thrown by the sun are vertical, and really diminish, by their monotony, rather than add to the pictorial interest of landscape scenery; so that a subject may be commonplace at noon, yet have pictorial qualities early in the day or late. We

must not, therefore, judge a scene at first sight, straight off. If we have experience, we can, at most, only estimate its possibilities; if we have not we must wait, if we would discover them.

But a very large number of us have, after all, to depend on the vague sense of beauty with which most are endowed, and which finds expression in the oft-repeated phrase, "Though ignorant of art, I know what pleases me." Well, it seems a pity in these days when good art wells up, so to speak, around, that all who amuse themselves by taking photographs do not learn, at least, to avoid taking bad ones.

There are three handbooks, published at a shilling each, by one of the colour-making firms, entitled, "Hints on Sketching from Nature," by N. E. Green, the first two of which contain in small space and clear language the substance of all that may be learned by book on the selection and treatment of landscape subjects. Burnet and Prout, David Cox, J. D. Harding, and Ruskin, are, of course, all good; their works may be said to be richly auriferous to those who know how to extract the precious metal: but those who have other occupations pressing will often be disgusted at having to dig over an acre of matter before finding the nugget of information they want. The third of these handbooks is on colour, with which the photographer is supposed to have no concern; few, however, will be the worse for the knowledge packed in it so close, and arranged so handily.

Having carefully read these little books, the learner may study with great advantage any of Blackburn's "Royal Academy Notes" that come in his way, and of these the old ones rather than the new. For the earlier of these handbooks consist mainly of rough sketches, showing the composition of each picture, and its light and shade, whereas those of the present day, done by photographic process, are for the most part facsimiles of the pictures, in which, as in the originals, the skeleton lines of the compositions are hidden, and lost in rich clothings of detail and finish. But even in the older books the student will be

simply bewildered by the quantity and variety of examples set before him, unless he starts with a decided object in view; and to obviate this I would advise a man, thinking, for instance, of a camera tour in the Midlands, to study trees and cottages, apart, or in combination; for these he will find there in great plenty and perfection, and to learn how to make the best of them will engage all his attention. If going to the coast let him look in Blackburn for examples of cliff scenery, rocks, old boats, seafolk, and studies of waves. If he goes to the Eastern Counties, how to dispose barges, river reaches, long belts of trees, and level horizons will need thought; while if he purposes rambling in Wales, that elysium of artists, he must be prepared for mist-shrouded mountains, waterfalls, rustic bridges, and boulder-filled streams. Each locality, too, must have appropriate treatment in the living objects introduced—sheep in Berks and Leicestershire; long-horned cattle in Devon; small shaggy steers in Scotland; the tall and active fishermen of Cornwall; the heavier men of our southern coasts: none of these should be introduced in other localities than their own. I have seen many Lowestoft fishing boats in Penzance Bay, but, for choice, would rather have Newlyn boats as furniture to any scene there. For similar reasons the Newlyn fleet, which I am told is often found fishing on the west coast of Scotland, cannot there be so appropriately introduced as vessels belonging to the neighbourhood.

But now, thanks to Messrs. Green and Blackburn, having, perhaps, somewhat clearer ideas than before as to choice and arrangement of subjects; with some knowledge of what each locality affords; and with some sense, in the matter of figures introduced, of the advantages of "keeping," we should be ready to make the best of those subjects to which we have given thought. The unexpected happens, perhaps, more constantly in photographic excursions than in any other, and, of itself, will give all needful variety to our labours. But, meanwhile, I would insist on the great additional strength and interest imparted to our pursuit by a definite plan of

work—a motive that shall bind our pictures into series—historical, architectural, or other. For example, having decided upon a place for one's outing, what could be more agreeable that to look it up in books with a view of doing a set of plates in illustration of its history? Archæology is, very properly, a favourite and rapidly-spreading hobby. Have we a leaning that way? Then let us try for a set of studies of a particular time, Saxon, Norman, Early English, etc. Again, many of the picturesque cottages that dotted the land fifty years ago have been replaced by improved buildings, much to the advantage of the occupants, but to the great disgust of the artistically-minded. It surely would be a worthy thing to secure good photographs of all the best ones left. Amateurs taking up this suggestion might find much pleasure in comparing the village and cottage architecture of different parts of the kingdom; perhaps, of different countries. An acquaintance of mine is getting a series of plates illustrating the places in Warwickshire known to have been connected with Guy Fawkes' Conspiracy. This, when completed, will include many views of interesting old houses where the heads of that wild-brained plot were born, lived, or met, and is likely to make an interesting book. It is scarcely necessary to say that at Stratford-on-Avon one would bear Shakespeare in mind; at Lichfield, Johnson; at Olney, Cowper; Ipswich, Wolsey; and so on. Many other lines of interest might easily be pointed out. Celebrated trees, or forest timber in general, taken for pictorial effect, or taken for identification of species; or water—inland water, pools, and quiet streams, chosen for their own sakes, if pretty, or studied with a view of getting good examples of reflections. The great point is to have an aim, and to stick to it.

It may be asked, "To what do the best photographers owe their successes?" If the books and the subjects to which they addict themselves are equally accessible to us, why do we not get equally effective work?" The question to some extent supplies the answer, viz., that we do not give enough thought to *effect*, and, for the most part, take our pictures when we can get them, and very

rarely indeed find out and wait till they are at their best. A member of the club to which I belong learned that a certain noble pile of buildings in the neighbourhood looked best in very early morning. He got up at four o'clock one fine day in summer, walked two miles to the subject, and brought back the best version of it we had seen.

Most of us can appreciate the broad masses of shade, the telling lights, the masterly opposition of objects, set so as to relieve each other in a fine picture; but face to face with Nature we find it hard to recognise these effects, and are led to fancy that artists must be specially favoured by good luck when sketching. The fact is, we see too much; we interest ourselves unduly in large scenes, and lack as a rule the artistic habit of looking for "bits," and the power of isolating and criticising them when found, apart from their surroundings. This, to my mind, is the great secret—a secret on which we shall do well to ponder. Quantity is of no concern in the matter. To the poet an uprooted daisy suffices—to the painter a sick child. Fancy proposing as subject a field of daisies to Burns, or to Fildes the foundling hospital!

Thus it happens that two men going out to sketch, one stops at a cottage, and gets out his pencil, while the other, perhaps, is remarking that he never saw a more commonplace building. "Hang the building," says the first; "I am not looking at it, don't see it; but there is an effect of light and shade under the projecting roof and recessed window that will go far to make a picture." Many an ugly prospect may, therefore, possess beautiful passages, for in nothing is it more true that a part may be better than the whole than in landscape scenery.

To the novice the so-called "picture finder" will be useful. A good one may be made with a disc of thin brass, $2\frac{1}{2}$ in. in diameter, with a square hole cut in it, 1 in. long, by $\frac{3}{4}$ in. broad, these being, as near as may be, the proportions of our plates. Have the disc blacked on both sides; it carries comfortably in the waistcoat-pocket, and is a useful companion.

Take this finder in hand when walking in the evenings; the

effects, being then broader and more numerous, will be the more easily found, and will soon be quickly recognised. After a time any such effects that may be about will be seen by the student even in the glare of mid-day; and he will then, having acquired artistic sight, be entitled to the congratulations of his artistic friends.

In Mr. H. P. Robinson's clever papers on pictorial photography pretty well all may be found that can be said as to the placing of figures; and in Mr. Robinson's fine landscapes the application of

St. Michael's Mount.
(9-inch lens.)

his principles may be studied to great advantage. There are few scenes that cannot be improved by groups of men and women, horses, cattle, or sheep. In the accompanying photograph of St. Michael's Mount the single figure adds greatly to the sense of distance, and helps one to appreciate the size of the rocky pile and high-perched castle. As to the direction in which these figures should be looking or moving, it should generally be obliquely, in or out, of the picture, rather than directly out, or in, or to either side.

It is well known that the diminishing lines of a road or path,

converging in distance, help perspective. If, therefore, in meadows or rough ground, there happens to be a bit of pathway, take advantage of it if possible; but here, again, do not let it cut the composition in two by running straight up, or across the picture, but let it go obliquely, and, if practicable, be lost in places.

Returning again to the business of choosing a subject, it appears to me that the simpler the elements of the scene—the fewer its constituents—the more likely are we to get it perfect. In an extended view we are almost sure to be embarrassed by ugly shapes and ungraceful lines. A famed photographer had on one occasion a tree cut down to better a composition; most of us have to take things as we find them.

I am well aware that there are scores of photographs as nearly perfect in composition as the best master's paintings. But these are the work of gifted men, not merely photographers, but born artists, who spare neither time nor pains to perfect their work.

These lines are penned for those who, like myself, take up their cameras at holiday seasons only, and have other things in hand for more serious times. And to such the few hints thrown out—as to the storage of summer plates for winter development; the linking our doings by some pervading motives; and the aiming at little, to do that little well—may, I hope, be acceptable.

Rosario Aspa

NATURE'S LIGHT-SCALES AS RENDERED BY PHOTOGRAPHY.

I.

PERHAPS the majority of people who have scarcely bestowed more than superficial attention either to the theory or practice of photography, as well as many of those who have considerable practical acquaintance with the art, seem to believe that, apart from the question of colour, any natural scene whatever may be truly and faithfully represented by a photograph, provided it is taken by skilful hands; that although a photograph *may* be a very palpable lie, yet, if such is the case, the fault must be due to unskilful manipulation, and not to any defects or limitations radically inherent in the process. On the other hand, experienced artists who can be trusted to express their views with reasonable freedom from bias, will tell us that there are many subjects in nature before which photography, in spite of its unquestionable powers, seems to break down utterly; and that such failures, although often depending upon the total inability of photography to paint the image in its natural colours, are still more dependent upon other causes more difficult to point out; for it is a significant fact that a skilful hand-artist can render in monochrome, by mezzotint, engraving or etching, the spirit and essence of those very scenes before which photography owns itself to be more or less completely foiled.

Now, the natural scenes which are here alluded to are for the greater part those in which is included *a great range of light and shade*, the highest lights of the picture being a very great number of times brighter than the shadows. All photographers will acknowledge the difficulties they have found in managing such

subjects, and the generally unsatisfactory nature of even the best renderings they can obtain.

Very good examples of landscape views involving a great range of light and shade is afforded by many views in the Alps or other snow-covered mountains. In the distance are tiers behind tiers of snowy summits, bathed in a glowing sunshine which beats down on them without hindrance from that pure, transparent upper air. In the middle distance are steep rocky slopes, mottled with pine forest, partly shaded, perhaps, by some projecting mountain shoulder, while in the foreground is a ruined and moss-grown woodcutter's shed, standing in the shadow of a half-overhanging clump of sombre pine trees. The distance, and it may be the sky as well, is characterised by the presence of major details and features essentially contributing to the beauty of the view, while in the foreground also, the main features and details of the ruined shanty, which serves to give a touch of human interest to the scene, stand out with sufficient boldness to redeem the shadows from monotony or flatness. "What a magnificent scene, and how desirable to carry away a record of it!" thinks the photographer; who, very probably and naturally undeterred by former experiences, forthwith erects his camera and expends one or more plates with carefully-chosen exposures, to be followed, later on, by the most careful development which experience can suggest. But do what he will, he is doomed to disappointment. It is not necessarily that he cannot get out the details in the shadows as well as those in the high-lights, for thickly coated plates of the best quality and in careful hands, will render a tremendous range of light and shade. He may have so carefully managed the exposure and development as to obtain a negative whose contrasts are such as to allow the highest lights to just imprint themselves at the same time that the shadows have printed to a proper depth. And yet how disappointing is the result; the snowy peaks are there, to be sure, but almost devoid of those delicate features of light and shade which added so much to their beauty in the real scene; the middle distance is flat, and comparatively uninteresting,

while the near foreground is vapid and seedy; the picturesque old shanty being depicted to be sure, but in a weak and ghostly manner which is utterly different from the boldness with which it stood out in the original scene. There is a weakness or mealiness about the whole view which is extremely disappointing. "The negative wants more vigour," perhaps thinks the photographer; who forthwith either intensifies the negative, or else develops another plate exposed on the same scene, with a view to more brilliancy. Foiled again, for it will now be found, in the printing, that the shadows have grown black and clogged up before the highest lights have imprinted themselves, the result being that the latter are "chalky" and the former black, aggressive, and devoid of details, although the half-tones are rendered in a far more cheerful and natural manner than before. In fact, the only way of getting a passable print is to *dodge* the printing, using a negative of strong contrasts and shading the shadows more or less during the printing, so as to keep them back until the highest lights have sufficiently impressed themselves; but this method can scarcely be successfully carried out with most negatives, since the lines of demarcation between the shadows and the rest of the view are generally complicated.

It is my object in this article to enter into an inquiry as to whether there are good grounds for supposing that there exists any inherent limitations to the powers of simple photography for depicting subjects characterised by an extensive scale of light and shade. There is the plain fact to be accounted for, that photography, as a rule, fails to successfully picture such scenes, the results comparing miserably with the work of a painter, or rather the etcher or engraver, for it is necessary to exclude the question of colour, whose presence should give to the painting a far superior value.

I venture to think that the result of such inquiry shows sufficient reasons for supposing photography to be inherently defective for the generality of such views, while the apparent exceptions to the rule may be adequately accounted for.

Above all things I wish to make clear what seems to be the most radical distinction between the method of depicting strongly contrasted scenes which is inherent in photography, the method adopted by a faithful painter or hand-worker in monochrome, and to show that the method of the hand-artist is really better calculated to yield a true *impression* of the view than the (doubtless) mathematically accurate methods or laws of simple photography. This may appear somewhat startling to those who still pin their faith upon photography as being a pictorial art which is necessarily true to nature in its results, provided that no mistakes are made in exposure or development. The chief objects of the inquiry are :—

1. To gain some idea of the real photometric value of the contrasts between high-lights and shadows as they exist in natural views.

2. To form some idea of the eye's appreciation of very various contrasts; that is, to find whether its appreciation or sense of contrast is proportional to or varies as the amounts of the contrasts estimated photometrically.

3. To form some idea what is the utmost amount of contrast which is available in a photographic print.

4. If it is found that the scale of light and shade existing in natural scenes is very commonly of far greater extent than that available in a photographic print, then to find out, if possible, what must happen when the very extensive light-scale of the natural view is *compressed* within the much narrower limits at the command of the photographic printer.

It is first of all necessary to review certain facts concerning natural light-scales in relation to vision, which at first sight may seem to have little bearing upon the subject.

In the course of this preliminary inquiry light will be measured according to its photometric intensity. If a sheet of paper is taken into a dark room and illuminated by a candle at some distance away, it will have a brightness which may be called 1; if another candle of exactly the same power is lighted and placed

close beside the first one, then the brightness of the paper will be twice what it was before and may be called 2; if there were twenty candles illuminating it, all from the same distance, of course its intrinsic brightness would be represented by 20, as compared with its brightness when lit up by one candle, and so on. But this measure of brightness must not apply to the *total* amount of light received by the eye from the sheet of paper, for it is obvious that this might be reduced to one-fourth by cutting down the paper to one-quarter of its area, without altering the intrinsic brightness of the portion which was left. Therefore photometric measures of brightness or intrinsic brilliancy must simply express the relative amounts of light sent to the eye by any area (of the object or source) which subtends a constant *angle* at the eye, which may be so small that it cannot be imagined to be divided; any square area, for instance, whose diameter subtends at the eye an angle of one minute of arc, or one-thirtieth of the apparent diameter of the moon. This will obviate ambiguity.

On commencing to inquire into the amounts of the photometric contrasts as they exist in nature, one is brought face to face at the outset with the utter incapacity of the unaided eye for forming any true estimate of the photometric relation between any two lights differing greatly in brightness, even when they are placed closely side by side; while, when they are viewed at different times or places, the eye is found to be utterly imbecile for the purpose, no true result being arrived at without the aid of reason and some special apparatus. The unaided eye will not help one much to arrive at the conclusion that the full moon overhead is intrinsically about *ninety thousand* times brighter than the newly fallen snow which it illuminates; yet, such is the case; and were it possible to hold up a handful of snow so as to see it projected, while still illuminated as before, upon the background of the moon's face, it would look as black as pitch in comparison, and the observer would probably conclude that the moon must be "perhaps a hundred times" brighter than the snow; but yet, how very far from the truth!

The fact is, the human eye is sensitive (on conditions) to a varying range or scale of light which is simply astonishing for the mind to contemplate, and almost incredible were it not for the fact that it admits of such simple and cogent proofs.

Fig. I represents the enormous light-scale to which the eye is sensitive. The brightness of pure snow under a vertical full moon is taken as the unit. Each vertical line stands for a degree or grade of light intensity which is just double that of the grade represented by the next line on the left. At the left-hand end of the figure the curve *a a* represents the rapidly increasing value of the light intensities represented, the height of any point of the curve above the base-line being proportional to the particular light intensity, the unit line I being about one inch in height. The light intensities corresponding to each line or grade are given in figures beneath (in round numbers). It has been demonstrated by experiment, and agreeably to theory, that the sun's face is intrinsically at least 500,000 times brighter than the face of the full moon, and therefore (since sun and moon have about the same apparent diameter) pure snow illuminated by a vertical sun is at least 500,000 times brighter than snow illuminated by a vertical full moon. Therefore, if the line representing snow in moonlight in the diagram is just an inch high, then the line representing snow under a vertical sun should be about *nine miles* high, in order to proportionally represent the relative intensity!

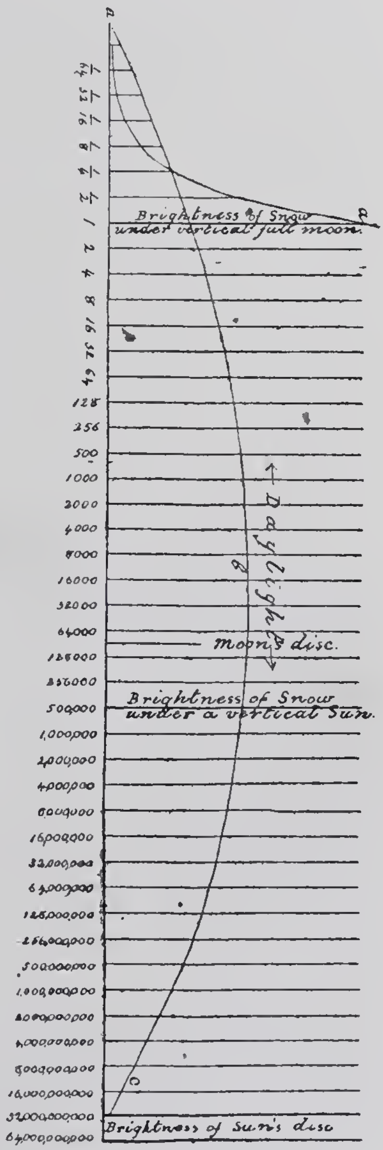

FIG. I.

But this is paltry compared with the line upwards of 900,000 miles high, which, on the same scale, would represent the brilliancy of the sun's face itself!! Scarcely any apology will be needed for not representing this diagram in its entirety!

Yet the eye can just manage to take a passing glimpse of the sun's face without being blinded, while, if we descend to the other end of the light-scale, it scarcely needs pointing out that the eye is sensitive to a degree of light many grades lower than that given out by snow under a full moon; and so I have carried the diagram seven more grades to the left, until perhaps the lowest degree of light, to which ordinary eyes are distinctly sensitive, is reached. How few ever realise the enormous differences represented in this diagram; who would dream, by their unaided senses only, that sunshine is so much as half a million times brighter than moonlight?.*

From the above facts alone it will be seen that the eye can only gain even the roughest notion of the relative brightness of two luminous objects when they are placed closely side by side and viewed together, when if one of them is more than twenty to fifty times as bright as the other, then the darker object will seem quite black in comparison, and almost the fullest possible sense of contrast is experienced. For the sense of a black and white contrast is by no means heightened in a proportionate degree by the fact of one of the two luminosities compared being one hundred

* If r represents the sun's radius, D the average distance from the sun to the earth, or moon, and R the reflective power of the moon's surface (it reflects about $\frac{1}{12}$th of the light which falls upon it), then the ratio of the sun's brightness to that of the moon's face is given by $\frac{D^2R}{r^2}$ which works out to 552,000. Again, if D stands for average distance of the moon from the earth, r for the moon's radius, and R the reflective power of snow (about one-half according to Helmholtz), then $\frac{D^2R}{r}$ works out to 92,000, for the ratio of the brightness of the moon's face to that of the snow illuminated by it. These results have been verified by experiment; in fact, the value of R is only ascertainable by experiment.

times or even one thousand times brighter than the other; the subjective effect is still black and white. Therefore it only needs pointing out, that if two widely different luminosities are not compared directly together, but are viewed at the same time but in different directions, or still more at different times, the unaided eye is helplessly incapable of forming any just estimate of their relative photometric intensities. In support of this may be mentioned the notorious blunders in exposure much by beginners at photography, and even by those who have had considerable experience. Having now just glanced at the vast range of light to which the eye is sensitive and noticed the incapacity of the eye for assigning true values to different degrees of luminosity, the next thing to consider is the sensitiveness of the eye to small contrasts and their variations as existing side by side. Here we have to deal with a sense of great delicacy. Most readers will be acquainted with the experimental "top," illustrated in Fig. 2. It is a disc covered with pure white paper or other material, on which can be placed segments of the blackest possible paper, as shown. On the disc being rapidly rotated about its centre, there will be a more or less grey ring visible traced out by the rotation of each of the black segments, and pale or deep in hue according to whether each segment occupies a small part or a larger part of the circumference on which it lies. If one of the black segments occupies a complete half of its zone, it is obvious that when the disc rotates there will be a grey ring visible of which the brightness is one-half * of that of the contiguous white paper.

By adjusting the proportion which any black segment bears to the circumference in which it lies, any gradation of contrast, from black up to the palest perceptible grey may be obtained, and by the use of a large disc and many segments a large number of varying shades of grey may be simultaneously viewed against the

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* Since the blackest paper reflects *at least* one-hundredth part of the light which white paper reflects, such estimations regarding the brightness of the grey rings are subject to a small correction.

same white background. It is found that if, while the disc is kept spinning, the amount of light falling upon the whole apparatus is varied gradually within very wide limits, then the contrasts between the rings and their background, and also between one another, will not perceptibly vary. This is one of the experimental proofs of what is known as the law of Fechner, viz., that any number of contiguous contrasts will always give the same impression or sense of difference, provided their *relative* photometric values remain the same, the effect being independent of the *absolute* degree of illumination, *within wide limits.* But the sense of contrast will be lowered or disappear either if the general illumination is so dull as to strain the eye or so bright as to dazzle it. Helmholtz and

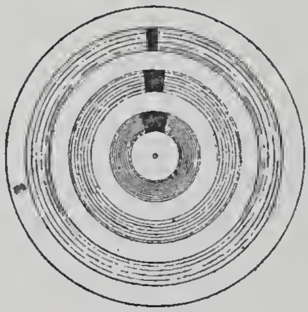

FIG. 2.

others have found that perhaps the highest delicacy of perception for very small contrasts prevails when the spinning disc is illuminated by the diffused light from a good bright sky, or in other words, in the broad light of day. In such illumination it has been found that some eyes are unmistakably sensitive to such small contrasts as 1 to $1\frac{1}{180}$ and many to 100 to 101. In full sunshine such small contrasts tend to become less visible, as is also the case when viewed in the duller light of a room.

In Fig. 1 the curve *a-b-c* is introduced to indicate by its height above the base line the sensitiveness of the eye to small contrasts under the very various degrees of illumination which come within the scope of the diagram. The curve indicates the maximum of sensitiveness in the illumination corresponding to broad daylight, or the most comfortable illumination, and shows a gradual

deterioration in the visual sensitiveness to contrasts, as the illumination grows either very bright and dazzling or very dull and trying to the eye ; towards either extreme small contrasts become imperceptible.

Having now gained some definite idea of the sensitiveness of the eye for the same contrasts under varying degrees of illumination, it remains to consider the nature of the law expressing the relative sensitiveness of the eye for *varying* contrasts, as seen under constant illumination or under the best conditions of illumination. Of course it is idle to suppose that subjective sensations can be accurately measured and expressed in figures ; all that a diagram can do is to make plain the essential spirit of the natural law concerning those visual perceptions excited in us by varying degrees of contrasts. Such a diagram is shown in Fig. 3, in which each vertical line stands for a degree of light, which is equal to $1\frac{1}{4}$ times the intensity of the light represented by the next vertical line on the left.

The curve *a-a* is the curve of light intensities, the height of each line up to the curve being $1\frac{1}{4}$ times the height of the next on the left. The figures below each vertical line represent the light intensities represented by each line, in terms of the short vertical line on the extreme left, which is the unit line ; while the curve *a-b-c-d* represents by its height the visual appreciation for the various contrasts represented. Thus the visual *appreciation* of the contrast 1 to 211 is represented by the height of line 211 up to the curve *a-b-c-d*; the appreciation for contrast 1 to 14·5 by the height of line 14·5 up to the same curve; and the appreciation of the contrast 1 to 6 by the height of line 6 up to the curve *a-b-c-d*, and so on. In accordance with the facts noticed above, the curve *a-b-c-d* is steepest for the smaller contrasts, thus indicating that the eye is the most sensitive to variations in such contrasts ; while, as the higher contrasts are approached, the curve flattens and grows less steep, indicating comparative dulness to changes or variations in the higher contrasts. For instance, while the appreciation of the contrast

1 to 1·56 is about double that for the contrast 1 to 1·25, it will be noticed that the appreciation for the contrast 1 to 55·5 is very little greater than that for the contrast 1 to 44·4. Now it is very easily proved by a simple experiment that ordinary dull black paper has only about one-fiftieth part of the photometric brightness of pure white notepaper under the same illumination; the contrast being what we call a good black and white. If such white paper is placed twice as far from the light as the black paper, and the two so viewed as to appear superimposed, it will be found that the contrast still appears *nearly* black and white, or very dark grey and white, although the contrast is now 1 to 12½ instead of 1 to 50. If, reversing their relative proximity to the light, the contrast is made 1 to 200 instead of 1 to 50, it will be found that the sense of black and white is by no means heightened in a degree at all proportionate to the great change in their relative photometric intensities. It is in accordance with such simple experiments as these that the curve *a-b-c-d* has been roughly plotted out. It is obvious that if the visual appreciation of contrasts was directly proportional to photometric contrasts, then the curve of appreciation *a-b-c-d*, instead of being what it is, *would take the form of the intensity curve a-a*, which is a vastly different thing. It will be shown, in my next article, that if the curve *a-a* were a true representation of the visual appreciation of the different contrasts indicated, then every attempt to depict the generality of natural scenes, whether made by the painter or the photographer, would be a certain and conspicuous failure.

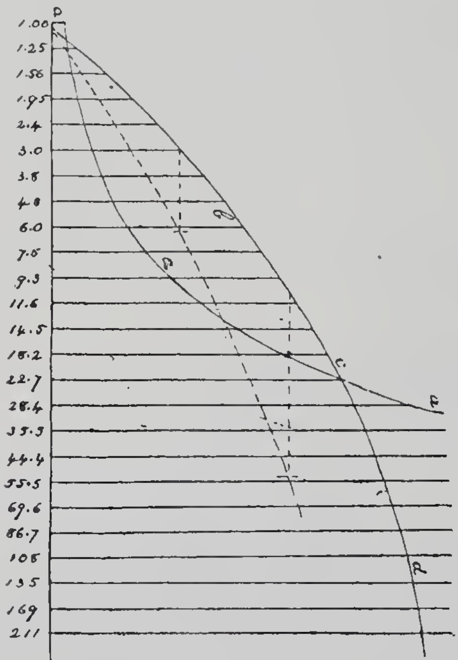

FIG. 3.

Returning now to the example of a landscape view described at

the outset, it will be necessary, before proceeding, to make some estimation, if only a rough one, of the photometric light contrasts involved. It is evident at a glance that there is a considerable range of light and shade, while a more careful consideration of the matter will show that the eye fails to appreciate the true amount of it. In the first place the highest lights consist of snow or clouds, illuminated by brilliant sunshine. To gain some idea of the relative luminosity of the darkest shadows of the picture, the first factor to be considered is the fact that direct sunshine in a clear sky is at least twice as powerful as the light from the whole sky without the sun; that is, the light from the sky alone is *one-third* of that from sky and sun together. The next factor to consider is the fact that the dark and weathered timbers and decayed herbage constituting the features in the shadows will certainly not reflect more than *one-eighth* part of the light which snow would reflect under the same illumination. And the last factor to be considered is the fact that this old timber, etc., is so largely overshadowed by dark pines, and part of it so shaded by the old roof, that it will be no exaggeration to say that the light effective for illuminating these darkest features will not be more than equivalent to *one-fifth* part of the whole sky. The actual part of the sky directly illuminating the shadows may be much less than this, but something must be added for light reflected from the surrounding hill slopes, etc., which is of course duller than sky; and we supposed from the first that direct sunshine did not reach the more immediate surroundings. Now if the above three factors, $\frac{1}{3}$, $\frac{1}{8}$, and $\frac{1}{5}$ are multiplied together they give $\frac{1}{120}$ only as representing the photometric intensity of the shadows of the view as compared with the highest lights. I strongly suspect that this rough estimation rather understates than exaggerates the contrasts which may be present in many such views as this. I find from experiment that the most ordinary of everyday scenes, obviously more open and less contrasted than the above, show contrasts between the highest lights of the sky and the darkest parts commonly equal to about 50 to 1.

We have seen then that the contrasts existing in natural views are far higher in photometric value than the unaided vision would lead one to suspect ; we must now consider whether the artist and photographer, and especially the latter, can command anything approaching to such contrasts in their pictures. In the first place, the bare fact that the different features in a natural scene are subjected to *very different* degrees of illumination, while the pigments which represent them all in a picture or a photograph are necessarily all subject to the *same* degree of illumination, will plainly indicate that the pictorial light-scale must be very limited, for it depends altogether upon the intrinsic reflecting powers of the pigments or colouring matter used.

Helmholtz found that the purest white which he could obtain reflected about one hundred times the light reflected from the deepest lampblack which he could obtain, when both were subjected to the same illumination. On comparing together a pure white paper and ordinary dull black paper, I find that the relative brightness is about 50 to 1 ; and certainly 50 to 1 well represents the *extreme* contrast at the command of the painter—a degree of contrast, however, which is very rarely used, in landscape views at any rate, for, to gain such a contrast, the shadows must be as black as the artist can make them. Now all who observe nature carefully will be struck by the fact that it is a very rare thing indeed to see a shadow of any extent which is so blank and dark that the eye can make out no features or details in it. The eye's accommodating power is so great that even in those views exhibiting the most extensive light-scales, it is able to make out the features or major details of the view wherever they exist, and rarely is a shadow so black as not to show them. If the deepest shadows of a view came in direct juxtaposition with the highest lights, then indeed they might appear very black by force of contrast ; but, as a matter of fact, this rarely occurs in nature, there generally being considerable separation between them. Therefore shadows approaching the blackness of lampblack in a picture or a photograph are to be avoided as giving an unnatural impression,

so that the light-scale available in a picture or a photograph is still further curtailed. As an experiment I took a piece of white paper and a piece of black paper, whose ratio of brightness I knew to be about 50 to 1, and laid them upon some excellent silver prints and platinotypes representing scenes with tolerably high contrasts, bright sky down to shadows under rocks and trees, shadows which could not have been printed deeper without looking black, aggressive, and unnaturally devoid of detail. It was then plain enough that the contrasts existing in the photographs were nothing like as great as between the black and white papers. As far as it was possible to judge, it would not be far from the mark to put down the photometric contrasts in the photographs as about 1 to 15, or 1 to 20 at the outside.

Another very important thing which sets a limit to the depth to which shadows may be printed in matt-surface photographs is the scattered light which is reflected impartially from all over the actual outer surface of the film. This scattered light is added to the already dim light reaching the eye from the features in the shadows, and therefore tends to drown the details and render the shadows blank. This is the principal reason why shadows, as rendered by silver bromide paper, and sometimes platinum, are usually mealy or misty. It is well known that if the surface of such a print is wetted the details in the shadows will show up with greater clearness. This is because the wetting causes the little roughnesses in the gelatine or other surface to disappear temporarily and the surface to become smooth, when it tends to reflect the light in a *regular* manner, away in one direction like any polished surface; consequently, if the eye is so placed as not to catch the glint from the surface, then the details in the shadows are clearly visible, being uninterfered with by any irregular reflection. It is for this reason that shadows are so much more transparent and full of detail when printed upon highly glazed papers, thus allowing a greater depth of shadow and range of contrast to be obtained, which perhaps is, as a rule, the only artistic merit they possess. Altogether it is not understating the

case to say that the extreme contrasts available in photographs is about 1 to 20, while in paintings it may be as much as 1 to 40.

And now the main question at once suggests itself—viz., What must happen when a natural scene presenting photometric contrasts of, say, 1 to 100, is represented in a photograph capable only of a light-scale in which the extreme contrasts are as 1 to 20? Obviously the natural light-scale will have to be *compressed*, as it were, into the narrower limits; that is, if the high lights of the negative are to just imprint their details at the same time that the details in the shadows have printed to a sufficient depth. For, if the contrasts or light-scale in the negative are greater than will permit of such a result, the print will be chalky and blank in the high lights when the shadows are sufficiently printed, or, if the high lights are just imprinted, the shadows will be over-printed and devoid of features.

Owing to consideration of space, I find that the answer to the above question, and the important deductions which follow from it, must be reserved for another article, to which this is chiefly preliminary. I shall then illustrate the consequences of the artificial compression of the light-scale by a simple and graphic diagrammatic method, from which a very important corollary will be made evident by the aid of those principles of vision which have just been pointed out and illustrated.

H. DENNIS TAYLOR.

ART?

IT is about as wise, and about as profitable, to ask whether photography is an art or science, as it is to ask whether it is a profession or a trade. Why not science and art, trade and profession? Probably no one doubts but that photography is at once a profession and a trade, and at the same time a science; but it is a somewhat disputed question as to whether or not it is allowable to speak of it as an art; and there is at the present time a strong tendency to talk and write of it as an "art-science," thus suggesting that it is not entirely an art or a science, but partakes of both. For my own part I speak of photography as an art, and I do not see that because it has a scientific side that it is any reason why I should not do so. Most, if not all, arts have a scientific side; although this is possibly more evident, and of greater importance, in photography than in any other art.

The controversy that has arisen in consequence of Mr. Pennell's paper on "Photography as a Hindrance and a Help to Art," which was read at the Camera Club Conference, has no doubt made many people, like myself, think of the art possibilities of photography. I therefore venture, without apology, to offer a few remarks on photography as an art; and it is my intention, in a short article, to give a few reasons why I think it should not only be considered an art, but be studied as such, so that its art side, being recognised, may be developed to the good of the community.

In discussing this subject it may be well to start with a definition of the term "art," and I am pleased to accept that of Mr. Stanley Little—"*Art is born of the marriage of Fact with Idealism.*"*

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* PHOTOGRAPHIC QUARTERLY, October 1889.

This being the case, is it possible that there can be any idealism —any art—in photography ?

That there is nature in photography no one, I take it, will deny; but it is a mistake to suppose that a photograph is—to say nothing of should be—a true representation of nature and nothing more. Let us first consider that popular form of photography, portraiture. Few people think of having their likeness taken by photography without paying special attention to their dress and appearance generally; and no photographer thinks of taking a portrait without idealising his sitter, as much as may be, by lighting, posing, etc. ; and where he fails to idealise it is either because he does not regard photography as an art, or because he is not an artist, and such a one is not worthy to be called a photographer, or to be trusted with a camera.

A photograph, like any other picture, is a representation of some object or objects. Now a representation of an object may be artistic or not—may possess qualities *born of the marriage of Fact with Idealism*, or may not do so ; but there is one thing an untouched photograph cannot represent, and that is fact alone. This must be so, for we all know that the image obtained by a photographic lens is not the same as the image obtained by the human eye. We may, I think, go a little farther and say that no object is, and certainly no group of objects are, seen in exactly the same manner by any two persons. Where pictorial art comes in is in seeing and representing objects in a truthful and, at the same time, a picturesque, or artistic, manner. This being so, and I take it no one will dispute my assertion, photography is an art.

Among the many divisions of the art side of photography are:—

(*a*) The choice of a subject.

(*b*) The point of sight.

(*c*) The position or posing of movable objects.

(*d*) The arrangement of the light.

(*e*) The retouching of negative and prints.

(*f*) The development of the negative, style of printing, mounting, etc.

I will now deal with these various divisions in the order I have given them above.

(*a*) *The choice of a subject.*—In photography, as in painting, much of the artistic quality of a picture depends upon the subject. By this I do not mean only the story told, but the picturesqueness of the various objects and groups of objects represented. In the choice of a subject it is most important to possess artistic taste and training, if really good pictures are to be produced. At the same time it must be remembered what the medium is to be used, and what are its capabilities and limitations. Photography, no doubt, is not a suitable medium for the reproduction of all subjects—no one medium is; but there are subjects which cannot only be more truthfully, but also more beautifully, reproduced by photography, than by any other means. The best cloud photographs are infinitely more beautiful than any painted by the greatest artist, living or dead. Obviously subjects in which colour is an important factor are not suitable for photography, nor are they for any other monochrome form of reproduction.

(*b*) *The point of sight.*—The position of the camera relative to the objects to be photographed is at least as important as the position of the painter to the objects to be painted. Several men may photograph the same object, say an old house, and perhaps one only will make a "picture," and that because he is an artist and therefore possessed of the artistic taste to see from which point of view the best picture can be taken. One, of course, can to a great extent learn by experience what view of a subject will make the best picture. Such experience is art-training, and is of but little good to any one not possessed of artistic instinct.

(*c*) *The position or posing of movable objects.*—Here the photographer has his greatest chance of proving himself an artist. There is not room here to fully deal with this question, which is practically the whole question of the composition of a picture; and, if there were room, the subject is too important a one to be dealt with otherwise than in an article to itself. But, without entering more fully into the subject, any one must see how

important is the position of the various objects, animate and inanimate, in a picture. The photographer cannot, like the painter, place objects in his picture in different positions to those they really have, hence the paramount importance to him of objects capable of being arranged, and posed, as his artistic taste teaches him that they should be.

(*d*) *The arrangement of the light.*—It can hardly be necessary to do more than mention this, for any one, who knows anything at all about pictorial art, knows what an important thing is the proper—the artistic—lighting of a picture. In studio work this is done by the proper arrangement of blinds, reflectors, etc.; and in outdoor work it depends upon the position of the camera, the state of the weather, and the time of year and day. The professional portrait-photographer, if he is not an artist, usually has but one notion, or at the most two notions, of lighting a picture, be his sitters ever so different. It is hardly an exaggeration to say that no two heads out of twenty look best lighted in exactly the same manner.

(*e*) *The retouching of the negative and prints.*—This of course is art work, and those who maintain that photography is not an art of course must say that retouching is no part of photography. I do not wish to say more about retouching here, as I dealt with the subject in my article, "Is Retouching Immoral?" in the April 1890 number of the PHOTOGRAPHIC QUARTERLY.

(*f*) *The development of the negative, style of printing, mounting, etc.*—The artist is not only wanted to choose the subject, the point of sight, to pose the movable objects, to arrange the light, and to retouch the negatives and prints; but he is also wanted in the developing of the negative and in the production of the prints, etc. Mr. A. Maskell, in a paper read before the Camera Club in answer to Mr. Pennell's paper, said,—"I can call to mind more than one, in some respects highly meritorious, picture in which are false relations of tone which are due to the artist himself, which, indeed, he would be the first to acknowledge. If photographic art were purely mechanical, if the machine did everything, this

would not be so; but if the worker, by his artistic perception, may so use the tools at his command, both in the process of developing and in the process of printing, as to produce greater artistic truth and character than a less artist could do, surely here is evidence of something more than that which is merely mechanical. It is this faculty for which we contend—which is, indeed, the very keynote of the question at issue. We cannot say, Let your artistically educated eye select the subject, the machine will do the rest; if it were so, half our position at least would have to be surrendered. The education of our artistic faculties must follow us into our developing room and into our printing room. There we must use our substitutes for brushes, colours, inks, and etching tools with judgment and discrimination equal to that exercised by the wielders of pen and pencil. It is, after all, but another, if perhaps a less noble, method of staining paper and canvas; less noble, because it demands a less order of talent, and because, we are willing to concede, it relies partly on mechanical assistance." It surely cannot be necessary to more than call attention to the amount of artistic taste, or the want of it, that can be shown in the printing of photographs. There is the choice now of so many different styles and processes, each one, perhaps, more suitable than the others for certain pictures, but no one equally good for all. Then there is the question of colour. And certainly the shape and size of the print is of no small importance. Also of considerable consequence is the suitable, and artistic, mounting and framing of the finished prints; but it will, I suppose, be maintained that mounting and framing photographs is not photography. It is no more photography than the framing of an oil-painting is painting; but as the choice of the frame in the latter case should be left to the artist so it should in the former. The proper framing of a picture, by whatever means it is produced, is from the artistic standpoint of the greatest importance.

It is, I fear, a fact that enough attention has not been given to the art possibilities of photography; but, it must be remembered,

it is in its early youth. Because it is limited in its power of artistic expression in a different, and perhaps a greater, manner than any other graphic art, is no reason why these possibilities should be neglected.

That photography shows individuality, any one in the habit of looking at photographs to any considerable extent cannot help knowing. Even in looking through a portrait album one can usually tell at once, if a photograph is good, by which of the leading photographers it was taken. This individuality in itself proves the artist faculty of the photographer—the artist ; proves that photography is an art capable of producing pictures *born of the marriage of Fact with Idealism.*

Alfred Paterson.

A RAMBLE IN SPIRELAND.

IT is an indisputable fact that change is pleasant to most men, and it is no less true that most of us fail to appreciate to the full the beauties of the districts in which we live, though when we return to them again after a long absence, we are struck by the fresh beauties revealed in the old familiar scenes. My own boyhood was, for the most part, passed in the south-west of England, where the bases of the tall cliffs of new red sandstone and jagged blocks of Devonian limestone were washed by the waters of the English Channel. In those days the sea was dear to me for many reasons—the water on bright summer mornings was pleasant to swim in; the long flats of shining sand, when the tide was out, formed a delightful playground; the shallow water afforded opportunities for shrimping; the rock pools, with their richly coloured growth of seaweed, seemed almost to belong to Fairyland; the caves in the cliffs were suggestive of smugglers, and if by chance a wreck was washed ashore, what romantic tales did the broken spars and splintered ribs give rise to? The harbour and its shipping, the coasting collier, the Newfoundland brig with its unsavoury cargo of salted codfish, the Norwegian barque with its load of timber—were all objects of interest to me; but I have no remembrance of enjoying the beauty of the sea itself. Only when I returned, after long years, to the old haunts, did the intense loveliness of the sea, in storm and calm, burst on me as a new revelation. The emerald gleam of the water in the distant streak of sunlight, the purple shadow of the floating cloud, the pale blue green near the shore where the waves swelled in gentle ripples over the white pebbles, were then, for the first time, noticed and appreciated. And now one of the greatest pleasures I know of

is to revisit that southern coast on a sunny summer day, when some fine-weather clouds are floating in the sky, and to wander along the cliffs and gaze down on the sea, "heaven's ever-changing shadow spread below," and mark the many-twinkling smile of the waves, the *κυμάτων ἀνήριθμον γέλασμα* of the old Greek poet. And so, too, it was with no small feeling of delight that I left for a short space, in the early spring this year, the "long backs of the bushless downs," the steep roads and wooded dells of Dorset, and found myself after a long railway journey in the East Midlands, with their "level flats and roundings grey." My camera went with me, for my object was to get some photographs of the splendid churches, with their graceful spires, which abound in Leicestershire, Northamptonshire, and the neighbouring counties. I had once passed some years in the region of spires, but had not appreciated them as I do now, for they were daily before my eyes, but now, living as I do in Wessex, a spire is to me an unfamiliar object. Dorset cannot boast of even one old stone spire, the one example usual given—namely, Iwerne Minster—having been rebuilt about fifty years ago of part of the old material, when no less, however, than thirty feet of the centre of the spire were sold to the waywardens, and used for mending the roads. The neighbouring county of Somerset possesses, I think, not half-a-dozen, Hampshire still fewer, and the neighbouring county of Wilts, though it can challenge all the world with its unrivalled spire of Salisbury Cathedral, yet is richer in towers than in spires. It was, then, doubly delightful to one like myself, accustomed to the square towers of Dorset, and the statelier Perpendicular towers of Somerset, to find the skyline of the East Midland plains broken by the slender graceful spires of Early English and Decorated times, and to find churches in which the work of the finest period of Gothic Architecture—namely, the first half of the fourteenth century—had not been so extensively swept away to make room for what Ruskin calls "that detestable Perpendicular."

In the present article I intend to give a short description of some of the most noteworthy churches that I visited, taken in

such order that they may be seen with the least amount of travelling. Let us imagine, then, that we have run down by express from King's Cross to Peterborough, and have spent a day—as a day may well be spent—in photographing the interesting pile of Peterborough Cathedral, which contains examples of every style of Gothic Architecture—from the Early Norman choir, commenced

Castor Church, Northants.

in 1117, to the Perpendicular Chapel, completed in 1528, and the central tower rebuilt in recent years.

There is a line from Peterborough to Leicester, belonging partly to the Great Northern, partly to the London and North Western Railway. The second station on this, about four miles from Peterborough, is Castor. Here a halt must be made; two churches will be seen from the station—the nearer one to the south,

and another, rather farther off, to the north. The latter is Castor Church, and a most interesting building it is. A footpath across the fields will lead to the village; the main entrance to the churchyard is from the south, and a capital view may be taken from the path leading up to the churchyard gate, another from the north-west, and another of a dated stone, 1124, over the doorway leading into the chancel. The chief glory of the church is the central Norman tower, with rich but not late work, crowned with a short spire of Early Decorated date. The carving on the central stage resembles scale armour; it is shallow, and may have been cut with a hatchet before the chisel came into use. The arcading round the tower is fine, the south doorway under the porch is ornamented with billet moulding; and the capitals of the pillars supporting the tower inside the church are elaborately carved with figures of animals; probably, this carving is of later date than the pillars themselves. The sedilia are good examples of Early English work, with the characteristic dog's-tooth moulding. Every style of Gothic Architecture is represented in this building, and half-a-dozen plates may well be expended on it. When due attention has been paid by the photographer to Castor, a walk of rather less than two miles will bring him to Wansford Road station, where he may take train to Barnack. Barnack station is not far from the village of the same name. It may here be noticed that, in the district which I am describing, it by no means follows that the villages are near the stations to which they give their names; in many instances they are fully two miles off, and allowance must be made for this when planning a tour partly on foot and partly by rail. I shall in all instances give approximate distances, for the guidance of any one who cares to follow the route described.

Barnack Church is a building over which an antiquarian cannot help growing enthusiastic. Probably the tower, at the west end, will be the first object that will attract his attention. The upper stage and the spire is of later date; but the lower part is of genuine Saxon, as it is generally called—Danish would be a

better term—built, probably, by Knut the king in the early part of the eleventh century. Here we see the characteristic long and short work at the coigns, a rude doorway on the south side of the tower, and inside, against the west wall, a stone seat, with a canopy of triangular shape, said to have been used by the king; a window above, with painted glass of modern date, represents the king sitting on this seat. The nave is Norman, the round-headed arches on the north side being supported by exceedingly slender circular pillars, those on the south side by shorter and thicker clustered shafts, a few years later in date than the others. The chancel is, for the most part, Decorated. The tower arch, inside, should be photographed; and the south porch Early English, with its high-pitched roof, makes a good picture. Barnack is a place from which it is hard to tear one's self away; but farewell must be said to it at last, and inquiry should be made for the road to Stamford, or, Stamford may be reached by train from Barnack station, but there are two advantages of going on foot—first, the walk is a pretty one, skirting Burleigh Park; and secondly, if one crosses the river by a footbridge, Stamford Priory is passed on the way to the town. Keeping to the road, nearly three miles from Barnack we catch a glimpse of that—

> " . . . mansion more majestic
> Than all those she saw before;"

to which about a hundred years ago the seeming "landscape painter"—he would in these days, probably, have been an amateur photographer—led the village maiden, whose unpoetical name Tennyson judiciously does not reveal in his well-known ballad. The verses come into one's mind as one sees the stately house; one seems to see the newly-wedded bride, gazing in admiration and astonishment on all the splendours of the magnificent dwelling, and seems to hear those words so proudly and kindly spoken by her lover—"All of this is mine and *thine*." Then a vision comes across one of the time when—

"... her people, softly treading,
Bore to earth her body, dressed
In her dress that she was wed in,
That her spirit might have rest;"

and when—

"Weeping, weeping, late and early,
Walking up and pacing down,
Deeply mourned the Lord of Burleigh—
Burleigh House by Stamford town."

Shortly after passing this it will be well to ask for the footpath leading across the fields to the mill, and to the ruins of Stamford Priory. There is a pretty view at the bridge, and a little farther on we reach the main road from Stamford to Uffington; turning towards Stamford we soon see the ruins of the Priory, or Hospital of St. Leonard, on the left hand. It is used as a cow-house now, but the triple doorway in the west wall is well preserved, and exhibits some most exquisite carving of Late Norman or Transition date; a semi-circular ring of moulding, standing out like a handrail from the arch of the doorway, to which it is attached only by a few supports, is, I think, unique. Another mile's walk will bring us into the heart of Stamford town, with its cluster of church spires and towers. Several of these churches are within a stone's-throw of each other:—All Saints', with its Early English arcading along the south wall and steeple, built at the beginning of the fifteenth century; St. Mary's, with its splendid Early English tower, crowned by a slender Decorated spire rising in the fashion of a broach spire without parapets or pinnacles; St. Martin's, in which may be seen the monument of William Cecil Lord Burleigh, Elizabeth's Minister, badly placed for photographing—are the most interesting buildings. On the way to the Midland station a general view should be taken, with the towers and spires grouping splendidly together, and the river in the foreground. I missed doing so, and have regretted it ever since. I went from the station to the town expecting to return and take this view; but was led out of the town in another direction in quest of the Priory, of the existence of which I had hitherto been ignorant, and then found it

advisable to go forward to Barnack. A halt may well be made on the way to Leicester at Oakham, and again at Melton Mowbray; both of which have fine churches, with peculiar towers, and staircases to the belfries breaking the symmetry of the outline. The next halt will be at Leicester, a town rich in associations with our history in the days when Dickon was king, of whom—to quote some stirring lines of an unpublished poem by Macaulay, which have become known to me—Oxford is made to say:

> "And if he ruled as tyrants rule
> He died as soldiers die.
> And for that back at which ye flout,
> It was a back I ween,
> That Lancaster on stricken field
> Ere this has never seen;"

a town memorable for Wolsey's sad end, and an ancient town withal, with its bit of Roman pavement wonderfully beautiful, and its piece of Roman wall, and the fragment of a Samian vase, preserved in the Museum, evidently a love token between a gladiator, Lucius, and Lydia, his sweetheart, inscribed with their two names in characters, possibly written by one of them—a touching memorial, showing how, nearly two thousand years ago, the same passion had sway in Roman Britain as now makes the chief joy of English homes. There are five churches in Leicester containing more or less of old work: The spacious St. Margaret's, with its Perpendicular western tower; All Saints', with a weather-worn tower on the north side, wonderful to relate, at present unrestored, though the church itself has been sadly mutilated by the improver; St. Martin's, with a central spire erected within the last thirty years and a nave of Early English date, with windows inserted in the fourteenth century. All these are worth a visit and a plate or two, though little can be done to St. Martin's from the outside, since it is so hemmed in with buildings. But the two other churches, St. Nicholas' and St. Mary's, are worthy of more careful examination. The former contains some Saxon work and Early Norman of a very rude and rugged type, as seen in the

interior; and close to the west end of the church may be seen a piece of Roman wall, the bricks or toils from which have furnished some of the materials of which the church has been built. St. Mary's is, however, the glory of Leicester; the most striking peculiarity is the tower, which, seen from within the church, comes down piercing the roof of the south nave, resting on arches of its own. Along the north wall of this south nave—it is too broad to be called an aisle—may be seen the ruthless manner in which Early English builders cut through the fine Norman arcading of the preceding age, when carrying out their restorations and enlargements. A doorway in the chancel is a good example of early hatchet carving; and the church can boast of two sets of sedilia: one at present used in the chancel, with rich Norman *chevron* work; the other towards the eastern end of the south wall of the south nave, against the east wall of which an altar formerly stood. The Norman arcading outside the north wall of the church is very fine, especially along the chancel. The crocketed spire makes a good picture from a narrow pathway with an old gateway, known as the Newarke; but the smoke from neighbouring factory chimneys may seriously interfere with the result, should the wind not be blowing it away from the church. Leicester has a splendid service of tramcars, and one of these, for a penny fare, will take the photographer to old Belgrave Church, the south doorway of which, under a Tudor porch has some especially rich carving. Taking train from the Midland station we should book to Market Harborough, the tower and spire of which are worth a plate from a south-western point of view. The tower has an uncommon feature, to be met with, however, in the next tower we shall come across in our ramble, for its walls "batter" or slope inward, so that the area of the cross section at the top is less than that of one at the base. If we photograph it, carefully levelling our camera, we shall get a result which might at first be thought due to the camera being tilted up. The interior of the church has little of interest in it; it is well, therefore, to return to the railway station, about ten minutes' walk,

and take the next train for Finedon, a wayside station, taking its name from a village about two miles off—to which, however, an omnibus runs. Here we have another "battering" tower beneath the spire, and a church in which the ubiquitous Perpendicular is less prominent than usual; ogee-headed windows, similar to those we shall meet with at Earl's Barton, will be seen; and inside an arch running across between the clerestory walls, as if to prevent them falling inwards, the upper and lower edges of this "strainer" arch have their convexities turned towards each other. A good

FINEDON CHURCH.

view of it may be obtained from a spot just outside the altar rails, for the chancel is long, and as there is no west window there is no danger of halation. Passing through the village of Finedon, we turn off into the main road that runs to Irthlingborough, about three miles off, where we shall find a church once noted for its fine steeple; but, unfortunately, this was found to be in such an unsafe condition that it had to be taken down, and is at present being rebuilt, to a great extent, of the old materials. The tower did not stand in contact with any of the walls of the nave, but at a little distance to the west, and was connected to the nave by

a kind of ante-nave or vestibule with a ridged roof lower than that of the nave. On the north and south sides of this connecting building are the main doorways, and from it a doorway leads into the church. The east window is a good example of Early Decorated work, the five lights being lancet-headed and running up to the top of the windows, and yet are not simply a group of Early English windows brought together under a common drip-stone, but are distinctly one window. The pillars and arches of the nave are built of alternate white and red stone, and give a rich

HIGHAM FERRERS CHURCH.

appearance to the church, which otherwise, owing to most of the glass being white, would have a very cold look; a very short exposure will be needed for this interior. From the churchyard, at a distance of about a mile as the crow flies, may be seen a lofty tower and spire—that of Higham Ferrers; but it is well not to attempt a short cut across the fields, for there is a danger of getting entangled between branches of the rivers and the dykes which intersect the valley between Irthlingborough and Higham. It is best to follow the road leading by the station, which does duty for the two villages; and it will be found that a walk of about

a mile and a half will bring one to Higham Ferrers. Before the church is reached the remains of Chicheley's College, now used as farm buildings, are passed—morning light, however, is needed to secure a picture; and probably, if we have started in the morning from Leicester and visited Market Harborough, Finedon, and Irthlingborough, it will be quite two o'clock before Higham is reached. A glorious church it is, and in the churchyard are two other buildings worthy of notice: the grammar school, close to the north-western corner of the tower, a Perpendicular building, handsome without being over-ornamented; and at a little distance to the south of the church is the old Bede House, also Perpendicular and still plainer than the other. The church has south and north aisles, and between them a double nave. The north nave evidently has taken the place of the old north aisle, and a new north aisle was then added. This arrangement destroys the symmetry of the church, as the tower and high altar are arranged with reference to the south nave. The chancel, if it may be so called, is simply a prolongation of the south nave, divided from it by a screen, and not, as usual, by a chancel arch. The chief beauty, however, of the church is its Early English western doorway, set back under a shallow porch, with double doors with somewhat flat tops, and above them a richly carved tympanum; in the centre of this is a bracket, on which once a statue stood, and on either side medallions carved with subjects taken from New Testament history. The east window of either nave is a fine example of Decorated work; and to the same date is due the original spire, which, however, with the upper part of the tower was blown down in 1631, and rebuilt at once of the original stones. This spire is crocketed, and at its base flying buttresses run out to the pinnacles —an unsightly arrangement, giving one the idea that the pinnacles will be thrust out by the weight of the buttresses and spire. There is ample space outside the churchyard to the north-east to take a general view of the church and spire, but from the churchyard itself to the west of the church there is only room to obtain views of portions of the building; but the splendid west

porch must not be neglected. The interior, on account of the great width of the building, is not easy to take without having recourse to what is at all times unsatisfactory, a somewhat wide-angled lens.

Scarcely a mile from Higham Ferrers is another church, less interesting indeed, since so much of it is Perpendicular, but still

EARL'S BARTON CHURCH.

by no means to be overlooked—Rushden, with its crocketed spire, not unlike that of Higham, a strainer arch in the interior and good Early English sedilia, a Decorated west porch, with its canopy connected with the buttresses in a most remarkable manner, and a north porch, too, which is worth a plate. Another may be expended on a general view in the churchyard from the south-east, and if the light is suitable a good view can be obtained from the street to the north-east.

Two courses now are open : either a two miles' walk to Irchester, to see the spire of the church, not far from which is Irchester station, on the main line of the Midland Railway, from which train may be taken to the Midland station at Wellingborough, and the town crossed to the North Western Station of the same name ; or, if we prefer it, Irchester may be omitted, and train may be taken

St. Peter's, Northampton.

from Higham Ferrers station, which has already been passed after leaving Irthlingborough. This railway runs through the North Western station at Wellingborough, to a station which does duty for Castle Ashby and Earl's Barton, but lies between the two and at some distance from either. Earl's Barton, about two miles off, is the village to choose if one alone can be visited, for here is a "Saxon" tower, with even more characteristic work than that at

Barnack. The "stone carpentry," as it is called, in the construction of the tower is very noticeable. The long and short work at the corners, the pilaster strips, the balusters of the belfry windows, all peculiar to the Saxon (or, more properly, Danish) churches built in the eleventh century, may be seen here as well as, if not better than, anywhere else. Nor is the church, setting aside its tower, devoid of interest. The Norman arches on the north side of the chancel, with their indented *chevron* work; the ogee-headed windows of the nave; the tower arch, as seen from within—all claim attention; and the view from the churchyard looking towards the south across the broad valley is one of great beauty. From Earl's Barton station we may go on to Northampton, a bright, clean-looking town, boasting of two noble churches: St. Peter's, near the station, a fine example of Late Norman work, with several unique features; the banded pillars inside, the cylindrical buttresses at the outside corners of the tower are, as far as I know, unlike anything to be found elsewhere; the tower arch, too, is magnificent, and the rich arcading on the outside walls of nave and tower is fine. The other church—St. Sepulchre's—is one of the four round churches of England. The rotunda, to the west of the nave, used as a baptistery, has its roof supported on massive Norman pillars, surmounted by pointed arches. This church, unlike St. Peter's, is not well suited for view-taking on the outside; but of the interior of this, as well as of St. Peter's, good views may be obtained, but in St. Sepulchre's it is well to bear in mind that a very long exposure is required.

Leaving Northampton station by the line that runs to Market Harborough, we break our journey, for the last time, at Spratton station, to visit the last spired church on our ramble, which, if not the most beautiful, yet is, in many respects, the most interesting of all—Brixworth.

A walk of about a mile across the fields will bring us to the village. The church stands on the ridge of a hill; to the north the ground has a desolate appearance; but to the south, as one looks from the church across the churchyard, and over the roofs of

the cottages in the village, to the well-wooded ground beyond, the view is full of quiet beauty. To turn, however, to the church itself, the first thing about it that will attract our notice, is a curious semi-cylindrical excrescence on the western side of the tower, in height about the same as the ridge of the roof of the nave. Within this is the spiral staircase leading to the belfry chamber, which has an outlook into the church through a three-light window divided by balusters. Evidently the staircase, and the lower part of the tower, are of so-called Saxon date; the upper portion of the

BRIXWORTH CHURCH.

tower and the spire were added during the Decorated period. But the nave is the most interesting part of the church: the materials are Roman, and it is far from improbable that the workmanship is Roman too; it would seem as if the building had originally been a Roman basilica, or hall of justice—the arches under which the present windows of the south and north walls are inserted having been the arcading, dividing the central space of the basilica from the aisles. The foundations of the outer walls of the aisles have been discovered; and the chancel walls were, at the last restoration (1886), rebuilt on the old foundations. It is a most interesting

building, worthy of careful study, as there is good reason for supposing it to be the oldest existing building devoted to Christian worship in the land. There it has stood, possibly for fifteen hundred years, often altered, often added to, but retaining the arches of Roman brick set by the hands of the conquerors of the world in their adamantine mortar. Within its walls, perchance, have met Romano-British Christians for prayer and praise ; then, probably, it remained undestroyed, but deserted, when the Romans had left the land, and the Kelts fled before our Teutonic ancestors to the hills of Wales. And when Augustine had brought back the Christian faith to England once more its walls re-echoed with Latin chant and psalm ; and probably from that time to this, with but little intermission, it has been used as a house of God, though dynasties have changed and the din of battle has been heard by the dwellers beneath its spire, and the form of service has been altered from time to time, as "the old order changeth, giving place to new." Fortunately for the photographer the churchyard is of ample size, and views may be taken from several points : from south-east, south, and north-west, the two latter showing the most marked peculiarities of the building. The interior, from the east end looking west, should not be neglected, as this view shows the window before mentioned looking from the belfry into the church.

And now it is time that this article should come to a close, so let us pack up our cameras and make for Brixworth station, if we intend to return to London, *viâ* Market Harborough ; or to Spratton if we prefer to travel *viâ* Northampton. And although we shall not have exhausted all the beauties of Spireland on our ramble, yet we shall have had an architectural feast, such as I do not suppose could be enjoyed elsewhere within so small an area.

T. PERKINS.

IN THE ARDENNES.

IT is only quite recently that the Ardennes have become generally known as a holiday resort; Mrs. Macquoid wrote a charming book about the district too, some ten years ago, and the sketches by her husband that accompanied it were calculated to have aroused more than ordinary interest in the holiday-maker, yet it has been left to the Great Eastern Railway Company to bring it within range of practical photography, by arranging circular tours to include every place of note at which a railway touches. The Ardennes is a rather comprehensive title given to a large tract of mountainous region and forest land, stretching right away from Belgium into France, then dipping down into Luxembourg—a region of many hills and valleys, rocks and rivers, whose natural features never reach imposing grandeur, and yet rarely descend to the level of mere prettiness. The principal rivers are the Meuse, the Lesse, the Ourthe, the Semois, and the Ambleve, but the distance traversed by each of them is so considerable, that to attempt to include them in one short holiday would scarcely be profitable from a photographic standpoint.

Living is very cheap, and the accommodation, as far as it goes, excellent; it has hardly reached the stage of providing dark rooms for photographers, but with a small travelling lamp and a curtained window, there need be no difficulty in changing plates at the end of a day's work. All this will doubtless be remedied in a year or two, when the Ardennes will be overrun by camera men in the same thoroughgoing fashion as they have done Switzerland, but it is a very pretty country as it stands. Truly it is beautiful, and the only drawback seems to be that of transit. Many of the most charming localities lie far away from the recognised show-places;

and though the sturdy pedestrian travelling with a hand camera, or a $\frac{1}{4}$-plate fitted with a roll holder, can occupy a position of some independence, a whole-plate, and half a gross of isochromatics in grooved boxes, such as I had with me, are calculated, with even the most energetic of workers, to give him pause. With this exception there is no more profitable country that I know of, and certainly none in a foreign land so easy of access. One can leave London by the eight o'clock train from Liverpool Street, and be in the heart of the Ardennes in time for dinner on the following day.

Immediately after the arrival of the boat train at Harwich, the steamer gets under way for Antwerp, entering the Scheldt in the early hours of the morning. One cannot sleep under the tramping of many feet; and, making a virtue of necessity, it is almost a new sensation to watch for the sun's rising. Across the broad and muddy Scheldt the land on each side is flat and uninteresting, the long expanses of marshy country, broken only by the roof of a red-tiled house peeping over the dyke, have, whether you wish it or not, something of a dispiriting effect; a windmill here, a church spire there, and then long rows of aggravating poplars further inland, that recall the monotonous avenues of some parts of Normandy. It is rather a dreary prospect at first for photographic work; yet even here with a hand camera one could wait for the broad-beamed Dutch smacks, that have apparently been modelled on the lines of a Chinese junk, manned by the squat and sturdy figures of Teniers; the brown sails and enormous weather-boards of the most conservative type of boat-building in existence. On second thought there is something familiar in the appearance of these wind-blown, reedy shores: it is Canvey Island at the mouth of the Thames, reclaimed centuries ago by Dutch settlers, but without that background of the Essex hills.

We reach Antwerp at last, having seen its spire dodging us about from one bank to another in the most unaccountable manner, and visible many miles away; we traverse long rows of quays, noticing the quaint houses on their sides handed down to posterity by generations of painters, but fast giving way to that

which is more modern and less picturesque, past the big steamers of the Red Star line, until our own moorings are reached. Then it is that there is a slight feeling of trepidation lest half a gross of plates in a huge portmanteau may not pass muster as easily as one could wish; it is dispelled, however, when the customs officers board us, and receiving the assurance that there is nothing contraband on board, affix their chalk mark without opening a single thing: bag and baggage we are passed on to the train for Brussels waiting a hundred yards away.

Antwerp, I should think, is worth a day at least: its streets are

DINANT-SUR-MEUSE.

wide, and there are one or two quiet corners of tumble-down houses; but the day should be given at this end of the journey, lest the country inland should prove too fascinating for your stock of plates. This latter was my own case, but it shall be remedied on a very early opportunity.

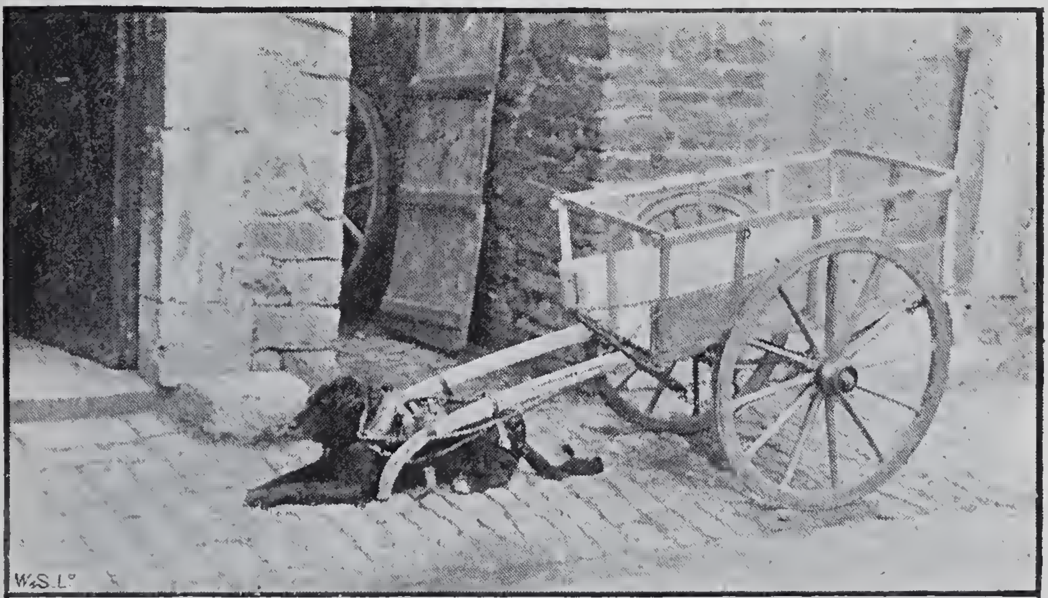
Brussels is a show city, and does not fall within the scope of a tour in the Ardennes, so that it will be well to get on at once to Namur, which has been called the gate of the Ardennes. There is nothing much to see in this place except its cathedral, more beautiful inside than out, and not unlike our own St. Paul's; but from Namur downwards, the scenery changes immediately and,

following the river Meuse, the views from the railway carriage are very beautiful. It should be said, however, that a steamer leaves Namur daily for Dinant, and it is a very comfortable way of travelling when bound on a photographic expedition, for one is enabled to fix upon likely spots *en passant*, and, marking them on the map, find the nearest railway station from Dinant, with the intention of paying a visit at some future time. There is scarcely a turn of the Meuse from Namur up to its source which is not worth consideration, and, if time will permit, it should be done on foot in easy stages. Being a navigable river, none of the rights of property are permitted to interfere with those of the pedestrian, and the seventeen miles, which separate Namur from Dinant, are rich in natural beauties of rugged crag and gentle, wooded slope, of villages like Houx, nestling under the shelter of perpendicular cliffs, and shadowed by the still imposing ruins of a stronghold of a bygone century.

Dinant itself is simply delightful from any point of view. It is a long, straggling town, with a huge fortressed rock rising sheer out of the river, under which it nestles. What dreadful havoc would there be in case of a landslip! The venerable cathedral, one of the most curious examples of architecture to be conceived, would hardly escape with a sound tile; almost half the town would be shattered, this rock rises so abruptly. All the English people in the Ardennes make Dinant their headquarters; and at the Hotel Tête d'Or it is a rarity to hear any other language spoken during the season. This is readily accounted for as Dinant is such a good centre from which to work. The railway connects it with all the places of interest on the Meuse and the Semois, while conveyances run up the Lesse valley to Rochefort, the famous caves of Han, and numerous other places. At Anseremme, the next village higher up, the beautiful Lesse comes tumbling in to join the waters of the Meuse—within easy distance, it might almost be called a suburb of Dinant; in fact, there is hardly a break in the houses which connect the one long straggling street of Dinant with the more reposeful Anseremme.

Halfway between them is a curious rock formation, known as *Le Rocher Bayard*, rising in the form of a pinnacle, and separated from a long chain of rocks running up the hillside by the road. Some enterprising climber has surmounted it with a flag, and the wonder is how it was done. Up the Lesse valley, an easy walk if the road were not so bad, is the Chateau Walzin, strikingly situated on an abruptly rising rock, with the river winding at its eet, a suitable subject for photographic illustration.

The walks in and about Dinant are charming; ruined castles



THE DOG-CART OF THE COUNTRY.

abound almost all the way to Namur. At Bouvignes, deserted Bouvignes, a powerful rival of Dinant in its palmier days, there is Crèvecœur in very dilapidated condition; a mile or two inland through Sommière are the ruins of Montaigle; at Houx, three miles down the river, are the fragmentary remains of Poilvache: the whole district teems with silent yet speaking evidence of the bloody times of Charlemagne.

Dinant is a sight worth seeing on market days; here in the Grande Place are gathered together, under the shade of the quaint cathedral, vendors of market produce of all kinds, greengroceries and hardware—men and women in the costume of the country,

ancient dames and comely girls, one and all actuated by the laudable endeavour to do business. Groups of dogs harnessed to their carts, some lying down, some standing up, as patient beasts of burden as one can imagine, take market-day as something to be thankful for; for although they have to draw loads astonishing to English eyes, they have their leisure here during hours of business. It is no uncommon thing to see a pair of them harnessed to a little cart, not unlike our coster's barrow, trotting along the country roads at a good round speed, burdened not only with vegetable and other produce, but with a driver as well; they are a strong

Anseremme (Le Rocher Bayard).

and shaggy breed, and seem to find nothing unusual in the *rôle* they have to play in the scheme of nature as adapted to the Ardennes.

One cannot stay longer at Dinant, however, and it will be well to seek the higher reaches of the river. The next place of any importance after passing Anseremme is Hastière, but I should strongly recommend the photographer to reach this place on foot if possible, crossing the river by the bridge at Dinant, or by one of the ferries beyond Anseremme. At Waulsort the river scenery of rock and wooded hills is some of the finest on the Meuse; the railway follows the towing-path right round the bend of the river

certainly, but many of the most charming glimpses are concealed by trees bordering the line. Hastière has a very good hotel, named after the place, and the tariff *en pension* is 7 fr. 50 cts. the day, about the average cost in this part of the country. The walks inland from this place to Onhaye and Anthée are typical of Ardennais scenery, and should be productive of good photographic results. Up the river some seven miles is Givet, a fortified frontier town in French territory; and if the journey is taken by rail a *douanier* will board the train at a little halfway station to receive your assurance that the camera is not intended for contraband purposes. The authorities are always very courteous to photographers, and there will be no danger in making an exposure in as close proximity to the fortifications as you may desire. I took the trouble to make inquiries on this point, possessed with a faint suspicion that such a proceeding was fraught with peril; but my informant, a military man too, seemed rather pleased than otherwise that I considered Givet worth a plate.

Givet should be the furthest point south, unless the photographer prefers to do the Luxembourg Ardennes in preference to those lying in Belgium. Personally I have left this district for another visit, and after returning to Dinant as the main artery of traffic and the most convenient point of departure for the eastern Ardennes, took the four-in-hand leaving daily for the nearest railway station at the little village of Wanlin. This is a delightful drive, climbing as the road does from Dinant over the hills that encircle the Lesse valley, so steep in some places that it is a relief to the horses and yourself to do some of the distance on foot, gathering the wild strawberries and raspberries that grow in great profusion all along the route. You obtain a good view of the royal residence as you rejoin the coach, and some little distance away that of Her Majesty the Queen of the Belgians as well. All delightful things must come to an end, however, and when Wanlin is reached there is a rather uninteresting railway journey to Jemelle and Marloie where you change carriages for Melreux *en route* to Laroche.

Laroche is a little town in the heart of the Ardennes to which I would call particular attention; it has grown of recent years, probably owing to its connection with the railway by a steam tram running between it and Melreux along the valley of the Ourthe. Travelling by this tram is a new and very enjoyable sensation, as, unlike any other tram that I know of, it gets up a highly commendable speed between the various stations, and, letting down the large windows, one can fancy one's self on a coach enjoying the fresh breezes that speed along the Ourthe. There are nine or ten stopping places, and you can get a very

LAROCHE.

good idea of the most favourable points for photography as you go: at Rendeux-Haut, for instance, there is a very picturesque mill; at Marcour, a pretty village and a genuine hermit who has made the journey to Jerusalem five times, once on foot; while at any of the little hamlets one could spend a whole day in illustrating the different phases of village life—the old women with their cows, and the little ones tending the goats that form so prominent a feature in the animal creation of the Ardennes.

Laroche has lost none of its simplicity up to the present, and the hotel tariffs are a marvel in point of cheapness. The river Ourthe winds round its walls, and the ruins of an old castle look down

upon as busy and thriving a little town as any you can find in the Ardennes. Tanneries abound in Laroche, not too close to be unpleasant, but sufficiently so to give it an unmistakable air of business; there are one or two old houses, but most that is modern is unpicturesque, and as nearly the whole of it has been rebuilt in these latter days its conglomerate aspect is not a thing of beauty except when seen from a distance. Then it is charming; from the heights that surround it on all sides one can look down upon Laroche with satisfaction, and follow the sinuous course of the gleaming Ourthe, mark the washerwomen on its banks, and the fly-fisher whipping the stream in hopes of a rise.

Whether down the river to Melreux and Hotton or up to Houffalize the photographer can hardly fail to find suitable subjects: the hills are many and of considerable height, and figure studies are always to be met with in the shape of blue-bloused wood-cutters rolling huge logs down the shallow stream; or, following the roads, meek-eyed patient oxen harnessed to their carts, drawing apparently from their foreheads instead of their shoulders. Particularly would I recommend a walk up the river to Houffalize, or at any rate as far as Le Herou, the finest part of the Ourthe valley.

Unlike Dinant, one can find something to do in Laroche after the early supper at half-past seven; the cafés are open for billiards and music, but most of the English people adjourn to the Casino and extemporise amusements of one kind and another for mutual benefit. This is as it should be, for the photographer has at the day's end leisure hours like other people, and is not indifferent to relaxation of the very mild kind provided. Laroche retires early to rest and is up betimes, for you can hear the clatter of *sabots* in the small hours tenanted by the good Larochois on their way to early mass. The *garde du nuit* one has to get accustomed to, and his tootling on the horn at hourly intervals from 11 p.m. to 5 a.m. has the same disquieting effect on the stranger who seeks repose as the crack of a whip had upon the philosopher Schopenhauer. Yet holiday making one is content to forget petty grievances,

and to accept the *garde du nuit's* horn-blowing as a necessary accompaniment to life in Laroche.

I have not, of course, been able to mention all the interesting spots in the Ardennes—a brief account of them would fill a volume; the rivers Ambleve and Semois, by all accounts the most beautiful of all, I have had perforce to leave untouched for the present, together with most of the untrodden paths far from the haunts of the tourist, a description of which no guide-book contains or ever will. Yet I have seen enough to convince me that there is variety enough in the scenery of the Ardennes to offer scope to the most exacting. Herein lies the value of it photographically—the peasant life. A rude but gentle people clad in quaint yet graceful costume, whose manners and customs are different to our own, in whose eyes the stranger, and especially the Englishman, is as welcome as the flowers in May; the docile bullock and the ploughing ox; the herds of goats climbing up the steep hillsides with such scant foothold as to excite wonder and admiration; the dogs harnessed to their little carts with the resignation bred of centuries; all these have interest for the student of nature, therefore the photographer at his best; and all are worth close study, for with their aid picture-making, apart from topographical illustration, is made easy.

Not that there is insufficient on the face of nature in the Ardennes to be able to study that also; the rivers are broad in most places and the lovely wooded hills surround them on every side. A sameness there is in it too; the same rocks of clay-slate and quartz meet you everywhere; the same undulating expanses of forest stretch out as far as the eye can reach; but there is no monotony in their aspect, see them where you will. Neither can I conceive a photographer with the instincts of an artist within him who would find in the Ardennes nothing of interest to him and nothing to admire.

BERNARD ALFIERI.

NOTES.

WITH this number of the QUARTERLY we enter upon our third volume, and find no difficulty in securing contributions which are interesting and instructive. Mr. H. P. Robinson gives us for this issue a very powerfully written article upon "The Transition Period," which, after perusal, will set men thinking. We are afraid that in many cases photography is made much too easy; and it is seriously to be questioned whether the advent of the hand camera has not placed photography on a lower level. The users have no hesitation in wasting, and it is very rarely indeed that twelve good negatives are secured from the exposure of that number of gelatine plates. We fear that but a very small proportion of the plates exposed are ever printed from, or, for the matter of that, give negatives *fit to print from.*

In this age everything is sacrificed to the saving of trouble, and in photography, like everything else, there seems to be a desire to do everything in the shortest possible time; and there are those who, we believe, carry "record-making" into photography, and do not show the pictures they have taken, but speak boastingly of the number of exposures. We have heard of a man who boasts much of his ability to use the hand camera, whose record was for some months three hundred exposures a week. What it is now we happily don't know; but out of the three hundred we feel sure that but few negatives are worth printing from.

We hold that the user of camera and lens should give the subject of the photograph he intends to take the same thought as the artist; and to obtain a good picture, a transcript of Nature, it is above all things necessary to study well the effect of light and shade and composition. This is never possible in a snap-shot, a name in itself which savours more of the village fair and its shooting-gallery than of photography.

In this quarter's magazine we give a reproduction of a photograph by His Highness Prince Antonio Ruffo—"St. Rosalia, Virgin and Martyr"—which, we believe, was first exhibited at the Vienna Photographic Exhibition. The model for this picture was a daughter of the Prince, who has for some time been endeavouring to compose photographs after the style of the old masters. The photograph we reproduce, and many other specimens of the same order of photography, have been until recently on exhibition at the Camera Club. Prince Ruffo has been especially happy in his studies of heads, and it may be interesting to give his method of working. He says: "In arranging the effect of the colours of dress and drapery it is my practice to always use neutral tints of different values or gradations, and specially to construct a background which shall be in keeping with the subject, using white or pink screens to

modify the lighting of the subject. I work with a Voigtlander's Euryscope lens, instantaneous English plates, developed with eikonogen, according to the formula of Professor Golfarelli, of Florence."

The other illustration in this number of the QUARTERLY is a photogravure made by Mr. Walter L. Colls from a negative by Mr. B. Guy Wilkinson, jun., "On the Margin of the Lake." Mr. Wilkinson is a very clever worker, has taken most, if not all, the photographic honours, and his work will always be found "on the line."

The last three months have been singularly devoid of interest, so far as any advances in photography are concerned. A very excellent exhibition has been held at Glasgow, perhaps the finest that ever has been opened in the kingdom; and Scotchmen are not a little proud of the high opinion that has been expressed by all who have had the good fortune to visit the same. The opening conversazione was attended by the Lord Provost and a most distinguished company. It can hardly be said that any picture caused a sensation; but there was a very considerable amount of good work.

The question of small work, from ½-plate and under, is receiving attention. We fear that with small work there is always a tendency in the exhibitor to send in too much, to crowd a lot of prints into one frame. A small picture requires plenty of margin, and very great care in selection; instead of which our experience teaches us that many exhibitors of this class seem to have only one aim, to cram as many prints as possible into a frame, most unequal in selection, tone, and execution. As a consequence small work does not receive the attention it deserves, and periodically a cry comes, "Small work is better out of exhibitions"; only to be followed by a counter-cry of "Workers with cameras ½-plate and under are not encouraged." And yet what beautiful pictures may be obtained on a small plate; but the smaller the plate the more difficult the selection of subject to compose well upon it. Again, the ½-plate and ¼-plate are of bad proportions. Already, with workers of artistic feeling, the 7½ by 5-plate has quite superseded the ½-plate; and another plate which would be very popular and give charming landscape pictures is the half of a whole-plate, 6½ by 4¼, instead of 6½ by 4¾, as at present. Another grave error with the bulk of workers with small plates is to get *too much* on the plate, and to place the principal subject too central in the field of view, often necessitating far too much prominence to the foreground. These and other faults are so apparent to those whose business it is to examine and criticise photographs that they are not at all surprised that at exhibitions small work is not popular.

Many will be pleased to notice that at last the best or notable photographs shown at the annual Exhibition of the Photographic Society of Great Britain are to be reproduced and published.* The letterpress, descriptive, has been undertaken by Mr. H. P. Robinson. In all some twelve pictures will be given, reproduced by the Woodburytype Company, as the illustrations to the QUARTERLY, the photograph to be about 7½ by 5, and mounted on a plate-sunk mount 15 by 12 or thereabouts. These will make a very valuable

* London: Hazell, Watson, & Viney, Ld., 1, Creed Lane, price 10*s*. 6*d*.

collection, and will, we believe, be much appreciated by all lovers of photography.

The use of gelatino-chloride printing-out paper has become much more popular now that such good results can be obtained on matt-surface paper. A very useful little book has been written by Mr. Walter E. Woodbury,* giving the history, manufacture, and full instructions for printing, toning, etc., with an appendix describing the special merits of the brands of paper on the market—Aristotype, Celerotype, and Obernetter.

Many interested in photography have not had an opportunity of seeing Mr. Ralph W. Robinson's charming collection of photographs of "Artists at Home." This is the most unique set of portrait photographs that we know of; and we are delighted to hear that the Committee of the Camera Club have arranged that they shall be included in the next One-man Exhibition, which will be devoted to the work of Mr. R. W. Robinson.

The Exhibition of the Photographic Society of Great Britain opened to the members and their friends with the usual pleasant *soirée* on the 26th ult., and to the public on the 28th. The *soirée* was, of course, crowded with photographers from all parts. The evening is usually regarded as an opportunity for meeting friends, and the pictures are reserved for the future.

We do not notice any distinctive feature this year. There is rather less than the usual amount of good, bad, and indifferent photographs, together with the sprinkling of eccentricities without which no exhibition would now be complete. If there is a feature at all, it is one of process, and is shown in the number of prints on very rough paper, often used, apparently, without any consideration of its appropriateness to the size and character of the subject. The hanging is as well done as could be expected, and the effect of the room is little different to that of previous exhibitions. It is evident that no unusual efforts have been made to attract novelties such as have been so successfully shown by some of the managers of provincial exhibitions. When will the Council learn that it is impossible to stand still, and that where there is no progress there must be retrogression?

The absentees are numerous. There is nothing from Messrs. Austin, Sutcliffe, or any other of the judges, except three copies from Mr. Hollyer and two pictures by Mr. Wellington. Among the noticeably absent are Messrs. Lambert, Tolley, Bourne, and Lyonel Clark. In the first edition of the catalogue we find to Nos. 392 to 399 a list of titles with Mr. Davison's name attached, which would seem to suggest that somebody had blundered, and that that popular exhibitor's works had been hung, catalogued, and—removed! —a mystery which, it is hoped, will be explained.

The judges, elected by ballot by the members, appear to have done their work (to which they were new) fairly and well according to their lights. They were Messrs. J. E. Austin, F. Hollyer, P. H. Newman, F. M. Sutcliffe, and J. B. B. Wellington. The absence of some names from this list may surprise many, and it is only just to explain that several members who had the largest number of votes declined to act, on the score that it would be at

* Price 2*s*., cloth.

least a change, and perhaps an improvement, to have fresh opinions. If we may judge by the small number of medals awarded, the new adjudicators seem to have had a very poor opinion of the exhibition; or possibly, on the other hand, a very high ideal of what is good in photography, if we may measure their opinions by the number of pictures they passed over, which, to more simple-minded photographers, were of a high quality. The case of Mr. Lyddell Sawyer is, perhaps, the most flagrant. This able and original photographer has, in the opinion of good judges, quite surpassed himself in at least two pictures, and there can be little doubt that these pictures are the feature which redeems the exhibition from the commonplace character it would have without them. The hangers have appreciated this by giving them the place of honour. Nos. 78 and 79, "Reflections" and "The Last Rehearsal," are by far the best of the collection, and it is possible that the minds of the judges were influenced by some of the other examples it contained. Indeed, we cannot help wishing—fine as the others undoubtedly are—that the two we have mentioned were the only ones. We will not say the effect, but the means of effect, is the same in all of them; and to show several of a similar kind weakens the effect, however beautiful and surprising. We cannot, however, speak too highly of the novelty, charm, and display of knowledge of art in these startling revelations of the power of photography.

The medals were awarded as follows. We take the objects for which they were awarded as they appear in the catalogue:—

49. "Sunset—Winter." F. P. Cembrano, jun. A delicate and poetical little picture of a sunset on the Thames.

255. "A Frosty Morning—St. Moritz." Mrs. E. Main. A set of four very clear and clean snow scenes; perhaps as perfect as such subjects can be. The half-tints on the snow are unusually well preserved.

340. "A Primrose by the River-Brim." R. W. Robinson. A cool, fresh, early-spring landscape, in which the figures are successful. A ploughman is offering a primrose to a laughing child in its mother's arms.

453. "Miss Laura Johnson as Desdemona." W. M. Warneuke. A theatrical portrait of the usual studio description, admirably retouched, but not well composed.

515. "Outward Bound," from a painting (autogravure). Autotype Company.

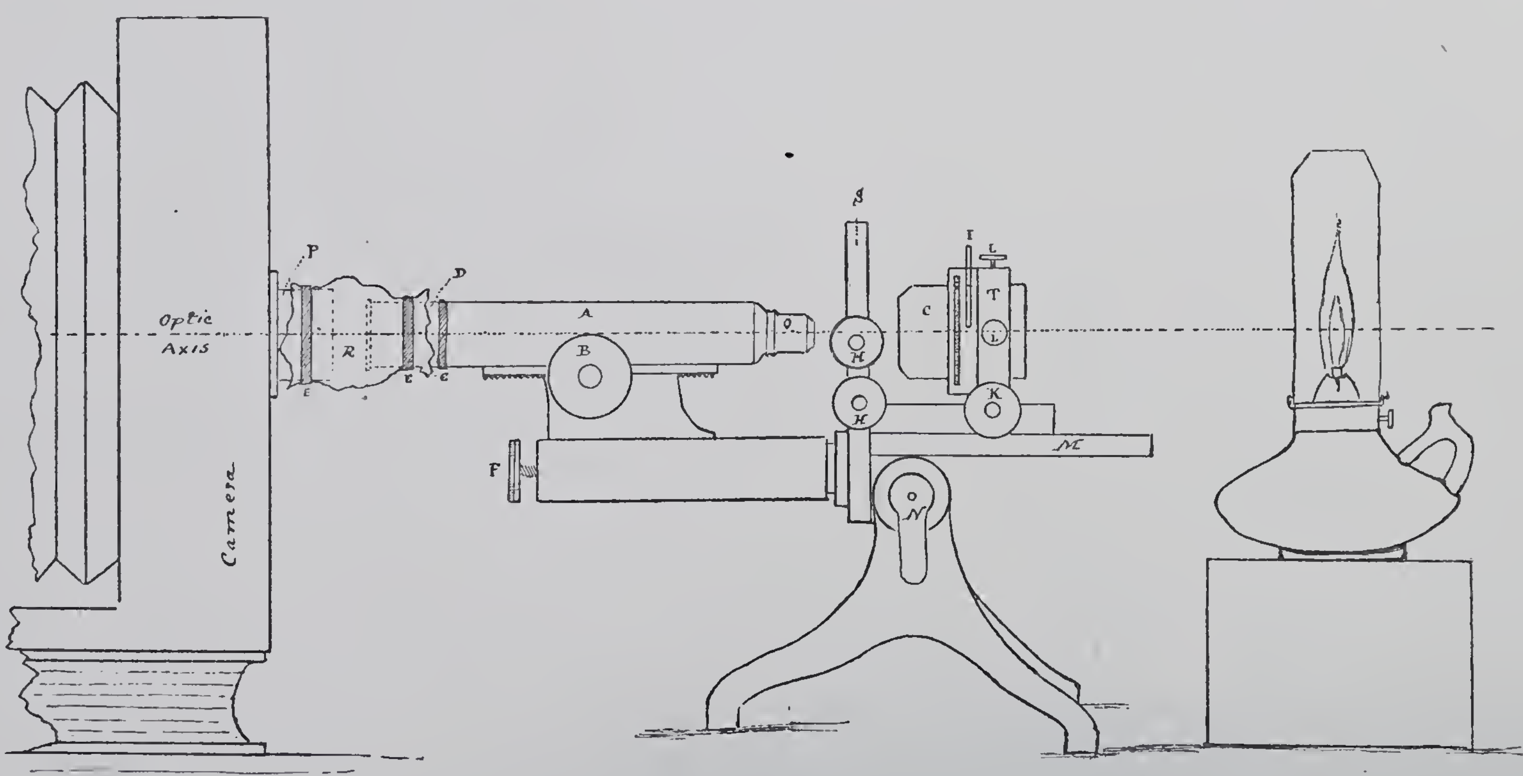
617. Photogravures. Walter L. Colls.

643. Miscellaneous Lantern Slides. G. West & Son.

700. Glass Cutting Machinery for cutting Photographic Dry Plates, the invention of W. Wilson, of the Paget Prize Plate Company. A very marvellous piece of mechanism, which will ensure the acme of exactness in cutting glass for negatives. It really seems surprising that for so many years all glass plates for photographic purposes have been cut by hand.

"PHOTO-MICROGRAPHY."

(BY J. G. P. VEREKER.)



Complete Microscope arranged for Micro-Photography, see page 83.

THE

PHOTOGRAPHIC QUARTERLY.

VOL. III. No. 10.—JANUARY 1892.

PHOTO-MICROGRAPHY.

MANY photographers are now putting away their cameras for the winter, and wishing for the time to come when the light will allow them again to pursue their favourite pastime. But, if they cared to try, there is a form of photography that has charms of its own, gives a wide field for experiment, and does not require daylight—namely, photo-micrography, or the photography of objects magnified by the microscope.

The appliances recommended for this purpose have usually been so expensive and complicated that many have no doubt been deterred from attempting it; for the most difficult and critical work all this may be necessary, but there are thousands of objects that can be photographed by much simpler appliances if only a little care is taken. All that is required is a microscope, a camera, and a paraffin lamp; and that satisfactory results can be obtained by these means the annexed photographs will show:—

Plate I., No. 1, is the beaded appearance in the scale of Speckled Podura × 900.
" No 2.* Triceratium Grundleri × 870, showing the dark and light dot resolution of the secondary surface, and the hexagonal surface resolution.
" No. 3. Naviculæ Rhomboides, showing dots half white and half black under oblique illumination × 1670.
" No. 4. Micrasteria Denticulata × 90.

* In this example it has been found impossible to reproduce the minute details satisfactorily in a half-tone block.

Nos. 1, 2, and 3, are taken with Reichert's oil immersion $\frac{1}{12}$ in.; No. 4 with Verick's $\frac{1}{2}$ in. wick; Nos. 1, 2, and 4, are taken with Zeiss projection ocular; and No. 3 with Zeiss No. 4 (old model) ordinary ocular. The light used was a paraffin lamp with $\frac{5}{8}$ in. wick.

To a beginner there is a tempting appliance sold, consisting of an adapter for the microscopic objective fixed to a fine screw which moves a small stage running on guides; the whole is screwed to the front of an ordinary camera. But though it may be useful for low magnifications, up to about 15 diameters, it can hardly be recommended; for in the first place its cheapness is delusive, as it costs about 20*s*., and an inch would cost, say another 20*s*. Now, a "Star" microscope of Beck's, with eyepiece, 1 in. objective, and iris diaphragm, in case, would cost 42*s*., and would be much more efficient, and could be used for much higher magnifications. For instance, with an inch objective and a camera extending 18 in., the limit of the magnification of the former instrument would be 18 diameters, whereas the microscope with the eyepiece would enable a magnification of 80 diameters to be reached; in either case photographs under lesser amplifications could be obtained; and again, a beginner ought to possess a microscope in order to understand what he has to represent.

About the purchase of the first microscope stand opinions differ: some people recommend the amateur to buy the most complete stand made, and if that is too expensive, the most complete that can be afforded, giving preference to a form that can be completed afterwards. Others recommend the purchase of a simple form, which can afterwards be utilised as a working microscope, as then, if it is injured by unskilful treatment, the loss is not so great.

There is much to be said on both sides; but, unless a cheap instrument is bought, it is perhaps preferable to buy a complete stand, or one which can be afterwards completed, with the exception perhaps of a mechanical stage, and to buy fewer objectives and appliances. In all cases the stand ought to be

firm and well made, with smooth even motions, and have a good fine adjustment.

If the amateur has a microscope already, he had, of course, better use that, at any rate at first; and not be led away by the fancy to buy a stand specially for this work. A complete microscope consists of the following parts, written in the order of their importance (*see frontispiece*) :—

1. An inclining stand with a body-tube A, and draw-tube D, fitting the tube A nicely, a fine motion F, a plain stage and mirror for illumination. 2. A tube fitting under the stage (not shown) with a wheel of diaphragms, or better, an iris diaphragm. 3. Rack coarse motion, B. 4. Substage T, to replace the tube fitting under the stage. 5. Rack and pinion K, focussing to substage, and centring screws L, L, to it. 6. Condenser C with iris diaphragm at I. 7. Rotating plate to stage. 8. Mechanical stage with rack and pinion motions at H, H. 9. Divided plates on stage to act as finders, etc. 10. Rack to draw-tube, and fine motion to substage. In reference to the above, the rack ought to be long enough to focus a 2 in. objective at least. A groove might advantageously be cut round the head of the fine motion in case a long camera is used, so as to focus at a distance. A rotating movement is often added to the substage for rotating oblique rays of light, but a rotating ring to the fitting for the stops in the condenser will answer most purposes. The rack to draw-tube and fine motion to substage may be considered luxuries in ordinary work, and are not shown. A mechanical stage is also a luxury, but very convenient in photography; a concentric rotating stage is mainly used for placing small objects like a Podura scale axially on the image of the lamp flame; it is often replaced by a rotating plate on the top of the mechanical stage, but this is less efficient. If no condenser is got it will be found that a $\frac{1}{2}$ in. is the highest power that can be used, and not then in all cases; a stand condenser, known as a "bull's eye," or a round flask filled with water, in this case replaces the condenser. If low magnifications only are required,

say up to about 100 diameters, a simple form of stand, with a tube substage fitting, will probably answer all requirements; a "Steinheil" lens is said to make an excellent achromatic condenser for low powers, and can be used without centring; it is also useful as a hand magnifier. The stand ought to remain firm in a horizontal position, and a clamp screw at N is useful for this purpose; a book placed edgeways under the tube will answer instead.

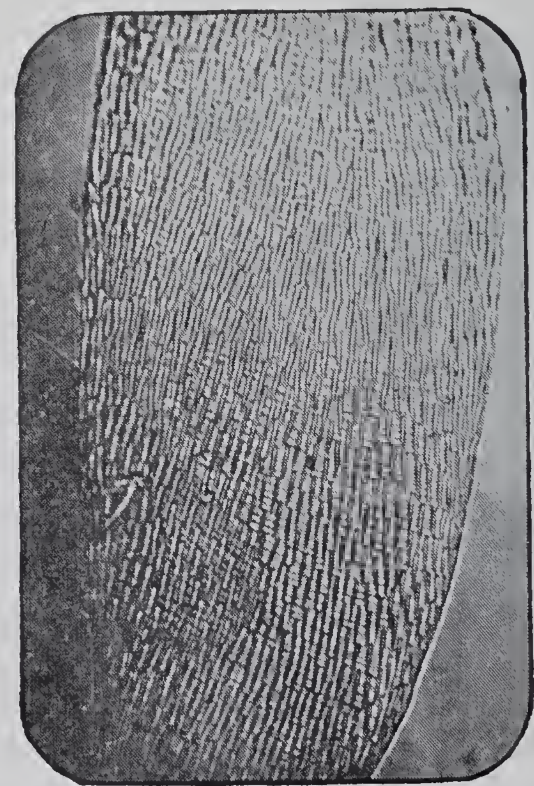


FIG. 1.—SCALE OF SPECKLED PODURA.

One eyepiece, or ocular, must always be got, and the most generally useful one is the "Huyghenian," known as A or No. 1. This ocular increases the initial power of the objective about five times; its focus is about two inches for the English tube, but is less for the Continental one. A second eyepiece, magnifying about eight to ten times, is, however, very useful. The A ocular is generally well enough corrected for ordinary photographic work; but as the focus decreases the corrections deteriorate. The photo-

graph of Naviculæ Rhomboides was, however, done with an eyepiece magnifying $7\frac{1}{2}$ on a short tube. For photography alone a projection ocular is made by Zeiss, which gives the best results. For a short camera the one of 1·77 in. focus ought to be used. This magnifies six times with the 10 in. and four times with the 6 in. body.

If apochromatic objectives are got, a special series of eyepieces

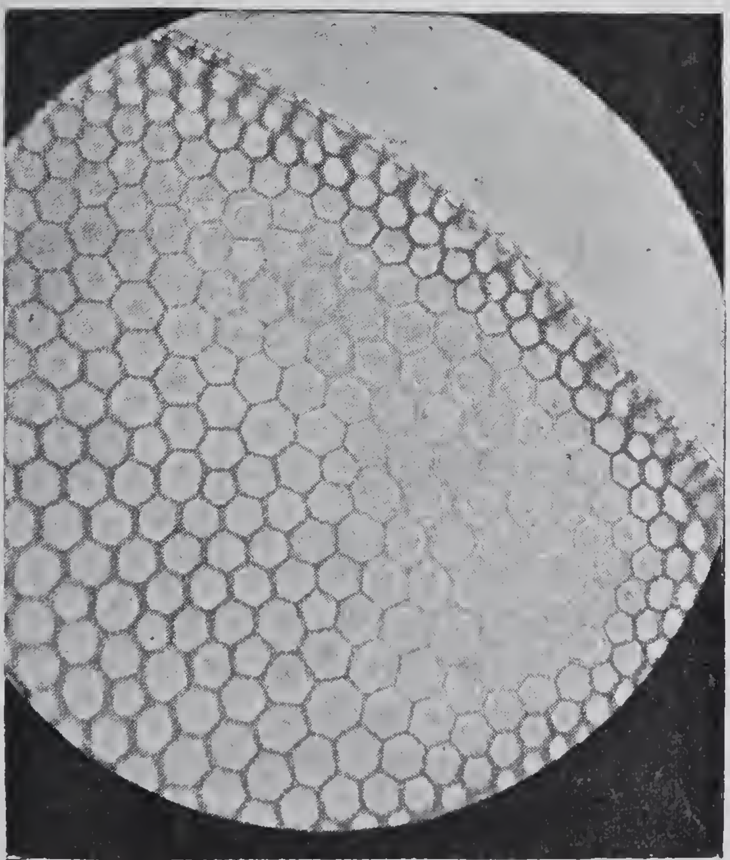


FIG. 2.—TRICERATIUM GRUNDLERI.

are used, known as "*compensating oculars*," in order to fully correct the objective. These eyepieces are useful for achromatic objectives, especially if they are of large angle; but for low powers are not so good. If, however, an eyepiece magnifying twelve or more is wanted, these are the best to get. They are said to photograph well.

Objectives may be divided into two classes—the apochromatic and the achromatic. The former combine three parts of the

spectrum together, and the latter two. The result is that the apochromatic are the best lenses, especially for photography. They are, however, expensive, and Zeiss cautions people in his catalogue against taking them to India. This is owing to the fluor spar in their construction. Reichert has, however, brought out some lenses like these, and known as semi-apochromatic, where this substance is omitted; and these lenses are becoming very popular. The power and angular aperture of lenses ought to be suited to the object. However, 1 in. of 20° (about) and $\frac{1}{4}$ in. of 80°, or $\frac{1}{6}$ in. of 110°, is a good beginning. The $\frac{1}{4}$ in. is, perhaps, better for the long, and $\frac{1}{6}$ in. for the short tube. Some prefer a $\frac{2}{3}$ in. instead of 1 in. The following is a specimen of a complete list :—2 in., 1 in., $\frac{1}{2}$ or $\frac{2}{5}$ in., $\frac{1}{4}$ or $\frac{1}{6}$ in., $\frac{1}{12}$ in. oil immersion.

Objectives ought to be purchased from some good maker, and ought to have as flat a field as possible. This is easily seen by examining a lined object, such as a stage micrometer, and seeing if the lines are curved or go out of focus at the edges. As microscopical objectives are of wide angle, they have to be corrected for a certain length of tube, so as to give the best results. English objectives are made for the 10 in. tube, and foreign ones for a 6 in. tube. Zeiss, however, makes lenses either for the short or long tube, and some English makers will do the same. Objectives of small angular aperture are not much affected by the length of tube; this falling off in performance can generally easily be seen by the edges of the field going out of focus. For instance, 1 in. of 16° is low, of 25° high; $\frac{1}{2}$ in. of 40° low, of 60° high. It is necessary to decide, therefore, on the length of the tube at first. The short tube is very convenient, and can be lengthened by means of the draw-tube to 10 in.; but if English objectives are chiefly used, it is best to buy an English tube length; this is about 8 in. long, and is increased by means of the draw-tube to 10 inches.

In using a microscope it must be looked upon as a complete optical system; in fact, it may be considered as a doublet lens, and if the eyepiece is removed, and the objective used alone, as a single lens. This way of using the instrument and the varying of

the length of the camera enables one to get many different magnifications out of one objective and eyepiece. The initial power of a lens is found by dividing 10 (the nearest average distance of distinct vision in inches) by the focus of the objective, thus, $10 \div \frac{1}{4} = 40$ is the initial power of $\frac{1}{4}$ in. If this be multiplied by the power of the eyepiece, it gives the magnifying power of the combination; thus, with an eyepiece magnifying five, $\frac{1}{4}$ in. magnifies 200 diameters. To apply this to the camera a proportion sum is made. As 10 is to the camera length, so is the microscope amplification to the camera one.

For example, a $\frac{1}{4}$ in. objective, an A eyepiece, and a camera extending 12 in. is used. Required, the magnification.

As 10 : 12 : : 200 : 240. Ans. 240 diameters.

If the lens is used alone the length of the microscope tube must be added. A $\frac{1}{4}$ in. on a 10 in. tube, and a camera extended 12 in., is used. Required, the magnification.

As 10 : 12 + 10 : : 40 : 88. Ans. 88 diameters.

This rule is only an approximation, but is convenient, as tables of magnifications at this 10 in. distance are given in opticians' catalogues.

For exact work a stage micrometer must be focussed, and its image measured on the ground glass. The enlarged image, divided by the real measure, gives the magnification.

The substage condenser is a most important adjunct, as by its means every sort of illumination can be obtained. The best form is that known as the achromatic condenser, of wide angle, as close to 180° as can be got. To use this condenser the substage must have centring screws (Frontispiece, L. and L.), as the image of the flame must be centred to the optical axis of the instrument. A cheaper and very popular form of condenser is the Abbé ordinary condenser. This, though better for being centred, will answer fairly well without it, as its field is larger. It can, therefore, be used on a plain substage, or on a tube fitting under the stage. Objectives also make excellent condensers; they can be fitted in

the substage by means of an adapter. There are also small condensers made to fit in the substage tube, costing from 10*s*. to 25*s*. The best illuminant, taking everything into consideration, is the limelight; but an ordinary flat wick paraffin lamp will be found to answer most requirements. One with 1 in. wick will be found most convenient; but a smaller size will answer.

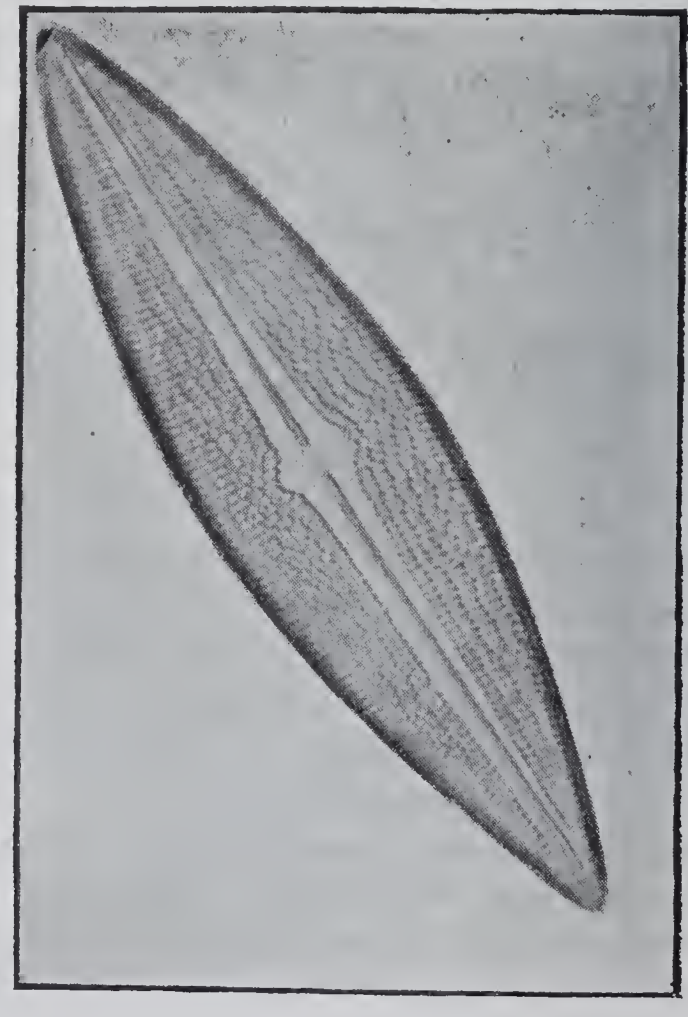


Fig. 3.—Naviculæ Rhomboides.

Any ordinary camera can be used, but it is preferable to have a long focus one; 18 in. is about the limit of extension, as this will give with an eyepiece about as much magnification as the ordinary achromatic objectives will stand, and at the same time enable the fine adjustment to be reached by the hand. The size of plate need not exceed $\frac{1}{2}$-plate, and in many cases $\frac{1}{4}$-plate will be found

quite large enough; at this distance the whole field of a projection ocular can be shown on a whole-plate, and this is more than is required. The ordinary double-backs can be used, but care must be taken not to shift the camera in putting them in. A single back arrangement to fit in instead of the reversing back is preferable, as joints need not fit so closely for this as for ordinary work. As a special camera Lancaster's "Multum in Parvo" will

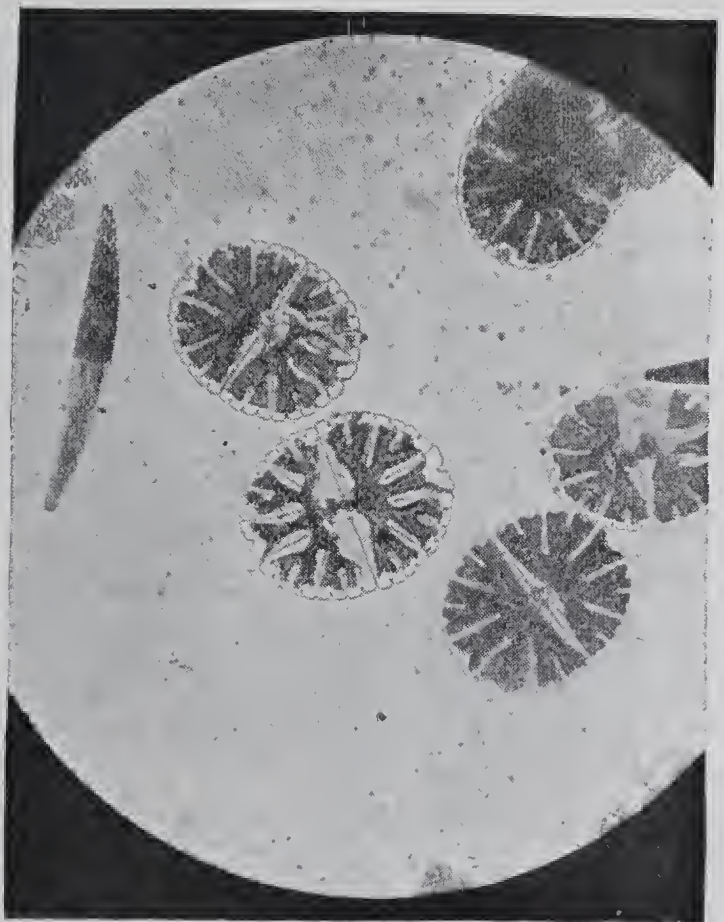


FIG. 4.—MICRASTERIA DENTICULATA.

be found cheap and efficient. The rough focussing is done on a piece of ground glass put in the slide, or else on the ordinary focussing screen; but the final focussing is best done on a piece of plain glass, placed in the slide as follows:—

Clean a spoilt negative and on one side make some scratches, or else rub some water-colour paint thinly on it, and let it dry; hold the plate against the window and carefully focus the focussing

glass on the scratches, or paint, from the reverse side of the glass, till they are as sharp as they can be made, and fix the focussing glass in this position. This glass is placed in the dark slide, with the scratches towards the inside of the camera, and is used as a support for the final focussing of the aerial image of the object; the glass is afterwards replaced by the sensitive plate.

The microscope must be attached to the camera by a flexible joint, or else many difficulties will occur. The following is one of the simplest plans: unscrew the lenses of the ordinary photographic lens from their mount (Frontispiece), and replace the tube in the camera as at P; if they will not unscrew, a brass or wooden tube must take the place of the lens tube; now make a loose-fitting sleeve of *thin* black indiarubber sheeting such as is used for focussing cloths, or else of some other thin opaque material, about four inches long, and of such a size that it can be clasped tightly by means of elastic bands E E, E E, round both the mount and the eyepiece end of the microscope; the sleeve must be arranged so as to allow a certain amount of play between the two tubes, and must not cramp the motion of the microscope. This junction is shown at R.

Two or three slips of cobalt glass of different shades, to be bought at the optician's for about 2*d.* apiece, a screw clamp for the camera costing about 1*s.*, microscope, camera, lamp, etc., and we are ready for work; the actual details of which will be best shown by an example.

Take for instance a Desmid, such as Micrasteria Denticulata, photographed in Fig. 4. The photograph was actually taken by means of an ordinary $\frac{1}{4}$-plate storing box instead of a camera; but of course a camera is better, and if extended to 12 in. would give the same magnification. The Desmid was bright green and mounted in glycerine, which accounts for some of the spots in the field. The camera being short, a $\frac{1}{2}$-in. is taken in order to get sufficient amplification. The tube of the microscope is put at the right length for the lens, in this case 6 ins., the object is placed on the stage, and the light reflected through it by means of the mirror, an A ocular is inserted, and the

Desmid required is put in the centre of the field and carefully focussed; if a higher eyepiece is available it now replaces the A ocular in order to enable the next operation to be done more exactly. Now hold a piece of cobalt glass between the light and the mirror; if the object is still sharp there is no need to trouble about the chemical focus; if not, by a slight screwing motion alter the length of the draw tube, and keep refocussing till the blue light and the white light focus coincide as nearly as possible; now place an elastic band E over the junction of the draw and microscope tube, and if made without a rack fix the sliding tube by the same means; see that the object is central, and fix it there if there is no mechanical stage by pressing down the clips, and for extra precaution against shifting a couple of pieces of gummed paper at the corners of the slide will be found useful; remove the mirror, and turn the microscope to a horizontal position; arrange the camera lens tube and lamp flame to the height of the optic axis of the microscope by means of books or boxes; though it is preferable to make wooden stools for the purpose, if it is the intention to do much work in this line. Push the camera out of the way, and look down the tube and see if the light evenly illuminates the objective. If it does, put the projection eyepiece in, extend the camera to the length required, and push it up so that the cap of the eyepiece is fairly close to the lens tube; now rotate the cap of the eyepiece till the edge of the field, which is the image of the diaphragm in the eyepiece, shows black and clear on the ground glass—this is the edge of the field shown in the photograph. If the A eyepiece is used this adjustment is omitted.

Look down the tube again, using the eyepiece, and, if necessary, refocus without touching the draw-tube; place the sleeve R over the lens tube and fasten it with an elastic band; bring the camera up to the microscope and pass the other end over the tube and fasten it also with an elastic band; place the camera square with the microscope, using a set square or the edge of a book as a guide. Focus the object on the ground glass by means of the fine motion, and see if the illumination is even. If it is not, look first

at the camera and see if it is out of the optic axis—a touch to the right or left will show this at once; if the camera is right, the lamp will probably want either raising or lowering, or pushing a trifle to one side or the other; if the illumination is still unsatisfactory a bull's eye interposed between the lamp and microscope will enable it to be remedied. Now, if possible, clamp the camera to the table; if this cannot be done, the dark slide must be put in or out very steadily. Put in a dark slide with a sheet of plain glass in it and draw out both slides, if a double one, or remove the back if a single one; by means of the focussing magnifier and the fine adjustment focus the Desmid as sharply as possible; the plain glass makes a good support, and enables this to be done comfortably. If there is much indistinctness, it shows there is too large a surface of light, and the iris diaphragm must be closed till the image is fairly distinct, or else a smaller aperture of the diaphragm is used: the image, however, is unlikely ever to be very sharp. The diaphragm in this case takes the place of stops in photographic lenses, but it is a mistake to use a smaller aperture than needful. Remove the dark slide and replace the glass by a dry plate, and re-insert it in the camera. Place a blackened card or a piece of brown paper between the objective and the slide (this is quite good enough to cut off the light). Draw the shutter of the dark slide, wait a few seconds for the camera to be steady, remove the card and expose for say two minutes, replace the card, close the slide and develop in the ordinary way. The plate will come up slowly and probably develop all right; if, however, under exposed put in another plate and give double the exposure. Before doing this it is prudent to refocus on the plain glass in case the object has shifted.

High-power work is done on the same principle, but in this case a substage condenser in some form is a necessity; and in cases where a large aperture is required, the condenser must be capable of giving a sufficiently large cone of rays, though of course there are many cases where these large cones are not required.

If the objective has a collar adjustment this is used for the

correction for the chemical rays, instead of the draw-tube; these corrections are, however, not required with the apochromatic objectives, the only correction then required being for the thickness of the cover glass.

As an example, take the photograph of Naviculæ Rhomboides: in this (Fig. 3) neither a projection ocular nor a wide angle condenser has been used, though naturally such a proceeding cannot be recommended, for photographing a difficult diatom of this sort, the amplification used is high, namely, 1670 diameters for a $\frac{1}{2}$ in.; the camera (Lancaster's 12 × 10, "Multum in Parvo") was extended to 18 inches, and Zeiss (old) No. 4 Huyghenian eyepiece, magnifying with 6-inch tube, $7\frac{1}{2}$ diameters, was used.

The outlines of the process are as follows: a slide is placed on the stage of the microscope, and a condenser in the substage, and a low power, say an inch, is put on the microscope; the edge of the flame is turned towards the microscope, and reflected through the condenser by means of the plain mirror; the object on the slide is now focussed, and the substage moved till the flame of the lamp is also in focus; the diaphragm is now closed or rotated till the smallest stop is in position, and removing the eyepiece the bright spot is brought into the centre by means of the centring screws. A $\frac{1}{12}$ in. oil immersion is now substituted for the 1 in., the object refocussed, and the condenser recentred if necessary; and then the condenser is racked slightly up or down, so as to give the best illumination. In the case before us, a semicircular stop was put in the condenser so as to give the effect of light and shade shown in the dots; the remaining procedure, with the exception of focussing for the chemical rays, as it is of doubtful advantage with Reichert's oil immersion [1], is the same as in the first case. An exposure of twenty minutes on Thomas's extra rapid plate, with $\frac{3}{8}$ in. wick paraffin lamp, was given.

It is impossible to give a table of exposures for this form of photography, as it varies with the objective, eyepiece, mode of illumination, object and plate, and must, therefore, be learnt by

practice ; as a guide to this the best plan seems to be that recommended by Mr. Pringle, which is as follows. Find out for each objective with a fixed length of camera and mode of illumination used what exposure will give full density to the brightest part of the plate, and use this as a standard to judge exposures by ; for this purpose it is not necessary to photograph any object, though, perhaps, it is convenient to use a diatom as a means of roughly focussing the objective and condenser, and several exposures can be made on one plate. It is necessary to get a fairly correct exposure, as the exposure ought, as a rule, to be suited to the developer and not *vice versâ*. Negatives taken with high powers, by means of a paraffin lamp, are often too flat to give good prints, but any of the ordinary modes of intensification will, as a rule, overcome this difficulty ; in some cases a better result can be got by taking a transparency by contact, and another negative from that. The scale of speckled Podura was printed by this method, both the transparency and new negative being made on Mawson's photo-mechanical plates ; this process has the advantage of not blocking up the shadows. Retouching cannot be considered allowable in scientific work, as it destroys the value of the photograph by making the draughtsman's idea of what the object ought to be take precedence over the rough drawing of the objective. This, however, can hardly apply against blocking out the field, if it is very dirty, though this must never be done if there be any lines which might be caused in it by diffraction phenomena. It will be remarked that no focussing work has been done by the motions of the camera ; the reason is that the camera has to be extended some distance to attain the same result as a small movement of the fine adjustment, as may be easily calculated (approximately) by the ordinary formula—

$$\frac{1}{a} + \frac{1}{b} = \frac{1}{f}$$

where f is the focus of the optical combination, and a and b the conjugate foci. The result of using the camera motion would be that the magnification would continually vary, and the length

of the camera is more usefully employed in varying this magnification.

The above mode of reproducing the images formed by the microscope may seem at first sight to be very much of the makeshift sort, but it is capable of doing a large amount of good and interesting work; and to the owners of both a camera and microscope the cost is nominal, and the amount of intelligent occupation is very large—in any case it is worth trying before more expensive appliances are bought.

For fuller details about microscopical manipulation, the reader is referred to one of the many books on the subject; these books give as a rule details about the various stands in the market. Microscope stands cost from 30*s.* upwards, and with mechanical stages from £9 upwards; well-known makers are not really dear when the workmanship is considered. The cheapest stands are the "Star" set, made by Beck, in Cornhill; but for details the makers' catalogues must be consulted.

All makers supply achromatic objectives; but Messrs. Powell & Lealand (170, Euston Road, London) are the only English makers of apochromatic lenses. Messrs. Baker & Sons (244, High Holborn, London) are the agents for Zeiss, Reichert and other foreign makers. It is only fair to Zeiss to say that he was the man who introduced apochromatic objectives, and pointed out their advantages.

J. G. P. VEREKER.

IMPOSSIBLE PHOTOGRAPHY.

THE unexpected is always happening, the impossible never occurs. This may sound like a truism, but there are some who doubt; perhaps it may better suit those who attempt to produce miracles to leave a little loophole for accidents, and say with the cautious humorous poet—

> "What's impossible can't be,
> And *very seldom* comes to pass."

Shakespeare "exhausted worlds and then imagined new"; but even his vast realms were hardly wider than those open to our art, for the photographer claims the whole universe of fact, and calls for some recognition in the regions of the imagination, though he cannot recall the past. The range of his art is from the infinitely little to the infinitely remote; he can follow the invisible star beyond the range of the telescope's vision and snap-shot it, or the equally invisible microbe and put it on the screen; but he cannot give us the form and body of the dead; he cannot restore King Arthur to life; and the folly of calling anybody else by that name, and photographing the substitute, need not be dwelt on, were it not so often done. In the introduction to the *Mort a Arthur*, the poet makes one of his characters say—

> "Why take the style of those heroic times?
> For nature brings not back the Mastodon,
> Nor we those times; and why should any man
> Re-model models?"

Not, however (here at once occurs an instance of the "very seldom"), that our national hero is really dead, for we all know that he was carried off to the island-valley of Avilon by three mysterious queens, and "Arthur will come again: he cannot die";

but it will not be easy to get him under the skylight in this century, unless, indeed, he quickly comes, as Tennyson has it—

> "Like a modern gentleman
> Of stateliest port."

In England we have almost given up the histories and mysteries of the past as subjects on which to exercise our art, but in America the Convention—holding, perhaps, with their national philosopher, R. W. Emerson, that "consistency is the hobgoblin of little minds" —still invite photographers to break their shins over artistic difficulties, by offering important prizes for subjects quite unfit for photographic treatment. I will not go fully into the consideration here of what our art can do and what it should not attempt, but will endeavour to condense my limits into a short sentence. *Don't attempt a subject in which you cannot hide the art by which a model is made to look natural, nor which compels anachronism.* The expert will always *know*, but the outside spectator must not have it thrust upon him that, as Alice says in Wonderland, "it is only a pack of cards after all." Now it was absolutely impossible to embody the beautiful myth of Hiawatha by aid of the gross material bodies of modern men; the same applies to the Arthurian Legends, and in a less degree to Enoch Arden, all of which subjects have been given to addle the brains of unfortunate American photographers; and I hope I shall not give offence in saying that all attempts I have seen to make photographic pictures of these subjects have abolished the poetry, and reminded me only of actors acting a tableau, or a scene in a wax-work show, without the advantage of the clock-work motions.

The subject for which a great prize was offered this year was the most lovely and pathetic of all Tennyson's Idyls,—Elaine. Elaine is a beautiful myth, an almost incorporeal dream of the past, and she cannot be properly represented by the, in comparison, palpable personality of even a pretty American girl, or Lancelot by all that is left of a modern young man after he has shaved off his beard. Nevertheless, it would have been interesting to English

photographers to see what their American brothers could make of such subjects. The opportunity was with us, but is lost for the present. I believe one of the competing sets was sent to the recent Pall Mall exhibition, and cruelly rejected by an unsympathetic hanging committee. The Photographic Society of Great Britain has apparently not the energy, perhaps not the power, to collect the pictures sent in for these competitions; but the younger, more flourishing, and enterprising institution, the Camera Club, has sufficient influence to induce the competitors to send their pictures for exhibition, and they would afford an interesting interlude to the One-Man exhibitions, which have been so successful. Fortunately, Dr. E. L. Wilson, in his excellent magazine, gives us a glimpse through reproductions of two of a series by one of the very foremost American photographers, who, I trust, is great enough to forgive me for pulling his pictures to pieces for the purpose of showing the absurdity and impossibility of these subjects, and, I hope, diverting the prizes to better things more within the limits of the practicable.

These pictures are accompanied by a description of how they were done, supplied by the artist himself, from which we learn that, "in order to properly fit himself for the arduous work, he devoted a period of six months to close study and investigation of his theme. He learned from Mallory's legends, written in the fifteenth century, what was the time of Arthur's supposed romantic reign, five hundred years since Christ. He studied the costumes and the mural and other decorations of that period, in works of art and historic description. Out of the knowledge thus acquired, he was able to direct the making of the maiden's gown, and determined what should be the shape of Lancelot's shield and lance, the fashion and quality of his armour. So, too, of the king's apparel, and the stately dress of Guinevere. The background of castle interior and hermit's cave were as carefully prepared." This lengthened period of close study by an intelligent student should have ensured accuracy if such a thing were attainable, and by the stress laid upon the time spent it is evident that accuracy to the

supposed period was the chief aim of the artist. We shall see how far he has effected his archæological object.

In the first scene "the lily maid of Astolat" is represented by a large-headed, not young enough, lady with tousled hair, gazing at Lancelot's shield, where, however correct its shape may be, "Sir Lancelot's azure lions, crowned with gold," do *not* "ramp in the field." The next scene is more elaborate, and we can better judge of the results of the six months' close study. Elaine lies dead in Arthur's palace, and Lancelot, as is, indeed, still the fashion, is feebly explaining that it was not his fault. The mighty knight, whom the king calls "our large Lancelot," and whose prowess was so great

> "That men went down before his spear at a touch,
> But knowing he was Lancelot,"

is impersonated by a rather short, and by no means powerful or graceful, young man. He is clean shaved, except his moustache. This is possible. The cultured Britons may have learnt shaving from the Romans, who had just retired from the country; but it is doubtful if such a hero as Lancelot would have removed his manly beard, besides which the Britons soon gave up the effeminacy they had learned of the Romans, and the King is represented with a full beard, a fashion his knights were sure to follow. Mythical heroes ought not to be allowed to shave; it is lowering to their manhood. He wears mascled armour, which is probably correct enough, but he also wears a dainty modern rapier, instead of the heavy sword of the period. This is fatal. The pattern of the sword could have been nothing like this "toasting iron," as the rapier was sometimes called. The remains of swords of about the supposed time are rather short and heavy, shaped like the Roman gladius, and have invariably cross handles.

> "He gave the king his huge cross-hilted sword."

The poet gives us some notion of what the weapon should be in his allusion to Arthur's brand Excalibur—

> "For all the haft twinkled with diamond sparks,
> Myriads of topaz-lights, and jacinth work
> Of subtlest jewellery."

It was not a fencing foil that the Lady of the Lake gave to Arthur when

> "An arm
> Rose up from out the bosom of the lake,
> Clothed in white samite, mystic, wonderful,
> Holding the sword."

The "lily-maid" is acting her part very well, and looks younger in this picture than in the other, but the lily she holds in her hand

"She made a pretty history to herself
Of every dint a sword had beaten in it,
And every scratch a lance had made upon it,
Conjecturing when and where."—*Elaine.*

(*lilium candidum*) was not introduced into England until 1596! She appears to be pleasantly and comfortably dead.

> "Look how she sleeps—the Fairy Queen, so fair!"

It does not do to think of this line while you look at her picture. Such draperies as she lies on were never made in a fifth-century loom, nor anything like them.

The expression of Guinevere—the haughty and naughty queen

—is appropriate; but although furs were much worn, I doubt the existence of ermine cloaks at the time, with the tails arranged modern fashion. She should have worn a tunic confined by a girdle. It took nearly another thousand years to develop the tight bodice shaped to the figure, with full skirts, as shown in the photograph. The British *gwn*, from which we derive the word "gown," reached only to the knees, over a tunic or kirtle. The

"I swear by truth and knighthood that I gave
No cause, not willingly, for such a love."—*Elaine*.

king is the finest figure, but altogether a mistake. He was not an old man; he was as young as Lancelot, and

"From spur to plume a star of tournament,
. . . . and charged
Before the eyes of ladies and of kings."

The architecture is as impossible to represent correctly as the costumes. The year A.D. 500 is taken by the studious photographer as the date, which, however, is too late by sixty or seventy years. The Romans retired in 410, and the Saxons began to

arrive before 450, and the only room for Arthur is between these dates, or a few years afterwards. The country in the year 500 was entirely in the possession of Saxons, Jutes, and Angles. These were

> "The Godless hosts
> Of heathen swarming o'er the northern sea."

Their early architecture was very rude, and almost entirely of timber. Even in the time of Alfred the Great stone buildings were very rare, and glass was not in general use.

Any fine stone building would be Romanesque in character, not late Saxon as represented; and stained glass, of which there are indications in the window, was not introduced into the country before the thirteenth century.

This is not captious criticism. I have been minute because I want to show how impossible these subjects are even when neither time, talent, nor money is spared. The time assigned to Arthur is an almost unknown period in English history; how then can it be possible to reproduce it? The legends of Arthur and the Knights of the Round Table were written at various dates, none of them earlier than the end of the eleventh century; and the writers cared nothing about being as archæologically correct as the photographer of these pictures professes to be. For instance, "Knight" was not a term of honour before the Conquest, and the Saxon cnichts were mere humble followers or servants. The writers of the romances took their characters, costumes, and arms from the life of their day, and were no more careful to be correct than Shakespeare was when he makes Fluellen exclaim, "Here comes Pistol, swelling like a turkey-cock," which was remarkable, seeing that turkeys came from America, and the New World was not discovered until nearly a century later than Henry the Fifth's time.

Besides the difficulty of finding what he wore and how he wore it, there is the awful doubt whether there ever was such a king as Arthur, and you cannot photograph a doubt. Mallory says (he had the honour of being printed by Caxton): "Dyvers men holde

oppynyon that there was no suche Arthur, and that alle suche bookes as been maad of hym, ben but fayned and fables, bycause that somme cronycles make of hym no mencyon ne remembre hym noo thynge ne of his knyghtes."

I do not blame the photographer, except for attempting an impossible subject. He is, as I have said, among the foremost, has studied closely, as he tells us himself, for six months, and got to know all that can be known; but however much poetry we may put into a photograph it is based on fact. These myths are very lovely when left in the mist, but they won't bear the fierce light of the lens; the poetry is consumed under the burning glass. You cannot embody a myth from nature with a camera, or revivify the dead in photography.

It may be said that painters produce these subjects, then why should not photographers also? The reply is that painters embody their imagination of these subjects, the photographer can only show what is before the lens. The painter may help the carrying out of his idea by the use of models, the photographer can only represent the models. The painter's representation of these subjects is to a great extent a convention which we have agreed to accept, and there are conventions to which we agree without trying to make believe much. For instance, we all know absolutely that Christ and His Apostles did not dress in coloured blankets, yet we have been content to let the painters for four or five hundred years dress them in that fashion; and I cannot call to mind any painter who has tried to be archæologically correct in costume and surroundings, except Holman Hunt, and his realistic Scripture pictures gave a great shock to the religious world when they were first produced. Now in a photograph we all know that, however much we may call the picture King Arthur, it is only a portrait of a dressed-up model. It is easier to believe in a painter's conventional Christ than in a photographer's Arthur, however correctly the latter may be dressed after six months' study; but in the photographer's case always, and in the painter's often, we find, to quote Charles Lamb, that "instead of realising

an idea, we have only materialised and brought down a fine vision to the standard of flesh and blood. We have let go a dream in quest of an unattainable substance."

Some years ago Mrs. Cameron tried some of these subjects; she also had her Arthur and Elaine; she also made the mistake of making the great king an old man (though she might have been right in making his helmet of tin, a metal much used by the Ancient Britons); but her most enthusiastic admirers are obliged to gravely shake their heads at them. I, also—may art forgive me! —am one of the guilty. Still earlier than Mrs. Cameron I had my Elaine and Lady of Shalott, and should have had Merlin too if I could have captured him; but he refused to sit, except for a fee I could not afford at the time. He was a mercenary old man, and cared nothing for art. The Lady of Shalott was a large photograph and a serious effort. At that time the pre-Raphaelite painters were as plentiful as impressionists are now. Their art, unlike impressionism, was not merely a smile at the public, but quite serious, and I tried to make a pre-Raphaelite picture in photography. Truth was fortunately not necessary, nor six months' study. All that was wanted was a weird effect, with some awkward lines in it, for the P. R. Brotherhood did not believe in composition. I made the barge, crimped the model's long hair, P. R. fashion, laid her on the boat in the river among the water lilies, and gave her a background of weeping willows, taken in the rain that they might look dreary; and really they were very expressive. It may be remembered that the Lady of Shalott, unlike Elaine, floated down the river, alive and singing, and

"Singing in her song she died."

This gave opportunity for a little more freedom, and I nearly wrecked the whole thing by making the model try different positions. I think I succeeded in making the picture very pre-Raphaelite, very weird, and very untrue to nature—I mean imaginative; but it was a ghastly mistake to attempt such a subject in our realistic art, and, with the exception of an Ophelia,

done in a moment of aberration, I never afterwards went for themes beyond the limits of the life of our day.

I am afraid there is more archæology than photography in this paper. There is a fascination about the Arthurian period that carries one away, and really the poetry that has collected around the legends is so beautiful that it is the duty of all those who care to save them from being burlesqued, and of those who care for photography, to prevent it floundering in wrong channels.

H. P. Robinson.

HOW TO MANIPULATE PRINTING-OUT SILVER GELATINO-CHLORIDE PAPERS.

IN silver printing as usually practised paper of special quality is first coated with albumin mixed with a soluble chloride, and to render it sensitive to light after drying, the product known as albuminised paper is floated upon a solution of silver nitrate. In contact with the latter substance, insoluble silver chloride and albuminate are formed and remain on the surface of the paper and beneath it, whilst a soluble nitrate passes into solution, the excess of silver nitrate present as a necessity in the body of the paper being essential to the formation of a vigorous image. Since albumin in solution is more or less viscous, it is plain that instead of applying it to the paper first of all, and then floating the albuminised paper upon the silver nitrate, we might begin by making silver chloride by mixing solutions of silver nitrate and, say, ammonium chloride, and then emulsify that substance in albumin, the paper being coated with that emulsion in the same way as glass, etc., is coated with an emulsion of silver bromide in gelatine. This method of working was in fact practically worked out by H. Farmer in 1887.

Many years prior to this, in 1848 in fact, a celebrated French amateur, Humbert de Molard, had shown that it was quite possible to emulsify silver chloride in gelatine, and coat paper with the mixture; but de Molard's process, simple and beautiful as it was, attracted little attention at the time. In 1865, Smith and Palmer experimented in the same direction, but it was not until 1882 that a thoroughly workable method of making silver gelatino-chloride for printing-out was given to the world by Captain Abney.

Obernetter of Munich, who had for many years previous placed on the market a collodio-chloride printing-out paper, substituted

gelatine for collodion about 1886, and the paper which bears his name was consequently the first of this sort to be introduced commercially. Since then Liesegang has followed suit with the Aristotype paper, and quite recently an English firm, the Blackfriars Sensitising Company, has introduced the now celebrated Celerotype paper, equal in all respects to any manufactured abroad.

To any one who has taken the trouble to make prints by this process and compare them carefully with others upon ordinary albuminised paper, it must be at once evident that the gelatino-chlorides bear the palm in delicacy of half-tone, and particularly in shadow detail. The time of printing is also very materially decreased, and there is every reason for believing that gelatino-chloride prints are more permanent than those upon an albumin basis. These advantages being so manifest, it is a matter of surprise that the process has not been more generally adopted by photographers, at least by those to whom the slightly enhanced cost of production is of secondary moment.

During the past few months, the writer has made a large number of experiments with the view of testing the various toning formulæ, etc.; and having fixed upon a method of working which has invariably succeeded in giving first-class results, and by which he has turned out commercially several hundreds of prints, he proposes to describe his method in the present article.

It may be well to begin by instituting a comparison between the film of gelatine which in the material now under consideration keeps the silver chloride *in situ*; and the film of albumin, which in ordinary silver paper performs a somewhat similar function. Albumin, owing to the action of the silver nitrate upon it, becomes coagulated, hard, and insoluble when the paper is sensitised, whilst gelatine remains throughout in its ordinary soluble and, when wetted, soft and easily injured condition. It is therefore at once apparent that more care must be taken in manipulating gelatino-chloride paper, particularly when wet, than would be requisite when dealing with albumin. The solutions must also be

as cold as possible, and the paper handled as little as possible, for the employment of solutions at a temperature of 80° Fahr. or approaching it, or too prolonged contact with the warm fingers, would inevitably result in melting the soluble film. For the same reason, artificial heat must on no account be employed to hasten drying, and the common practice of blotting off the finished prints must be utterly discarded.

The paper itself, as met with commercially, resembles at first sight doubly albuminised ready sensitised paper, but closer inspection reveals the fact that it is considerably heavier than that employed in the older process. If a small piece of the paper is immersed in ordinary tap water, this will become slightly milky, indicating that a trace of some soluble silver salt is present. If the temperature of the water is gradually raised, the sensitive coating will gradually dissolve, revealing the fact that there existed beneath it a layer of insoluble gelatine combined with a white or rose-coloured pigment, the use of this insoluble layer being both to impart a high gloss to the image and to keep it on the surface of the paper. In this connection it will be interesting to observe that in albuminised paper, the insoluble layer is over the greater part of the sensitive surface, whilst in gelatino-chloride paper it is wholly beneath it.

The paper itself keeps remarkably well under favourable conditions; the writer having used a sample of Aristotype paper which had been in a dealer's hands for at least a year, and probably for much longer, and obtained from it first-class results. The keeping qualities of the paper will, however, depend very greatly upon the manner in which it has been stored, damp causing the paper to deteriorate very rapidly, for which reason it is advisable to obtain it as fresh as possible, preferably from the manufacturers themselves, or, if this is impossible, from that dealer who sells the greatest quantity of it.

The paper being fully twice as sensitive as albuminised paper, care must be taken not to expose it needlessly to light. Care must also be taken that the negative to be printed from and the pressure

frame are both perfectly dry, for the slightest trace of damp will infallibly result in a stain, and if the negative itself is damp, the paper will, in all probability, stick to it.

On account of the thickness of the paper it is well, though by no means essential, to employ a rubber pad between the back of the frame and the paper, just as is done in platinotype printing, such a pad being also an additional safeguard against damp.

With thin, delicate negatives, printing will be found to take place very rapidly, from which cause prints can be made in light which would be quite useless for ordinary work.

There is a marked difference in the behaviour of this paper during printing as compared with ordinary sensitised paper: the shadows in the latter case bronzing, as is well known, when printing is carried too far; whilst, with gelatino-chloride paper, little or no bronzing occurs even with considerable over-printing. The advantage of this is sufficiently manifest, as in consequence a print can be saved by treating it as will be described later on, and yield as good a final result as if the printing had been stopped at exactly the right time.

Generally speaking, sunlight can be utilised for printing if the negative is of average density. If, however, the negative is at all thin, diffused light should be employed. From negatives too thin to yield good prints by the ordinary process, surprising results may be obtained by this process, by over-printing rather considerably in very weak light and then reducing the print in the manner to be hereafter described.

The extent to which the proof should appear over-printed in the frame will depend upon the toning bath it is intended to use. With the plain sulphocyanate bath followed by hypo., the proof should appear rather less over-printed than if ordinary sensitised was being used; but if it is intended to simultaneously fix and tone the over-printing must be very considerable indeed, otherwise the finished result will not be dark enough. The difficulty of judging when to stop printing is to the writer a serious objection to the latter method of working.

Printing over, a perfectly clean dishful of water being under the water tap, the print is plunged face upwards beneath its surface and left there for a few seconds, or until the paper has become quite limp, a soft camel-hair brush being employed to remove any air bells which may have formed. One edge of the paper is next seized with the fingers, or, better still, with an ebonite forceps, and the tap being turned on, the print is kept in *vigorous* motion, worried about, in fact, in the water for two or three minutes. If the operation is conducted exactly as described, no trouble will be experienced during toning. If, however, the print is simply placed in the water and left to take its chance, or worse still, if half a dozen are washed together, uneven toning will be sure to occur.

As regards toning, the writer has tried nearly every formula which has been put forward, but has found none to yield as uniform results as the following :—

Boiling water	16 oz.
Ammonium sulphocyanate	150 grs.

When dissolved and quite cold, add two grains of gold chloride, shake well, and filter.

The writer has obtained extremely variable results with different samples of commercial gold chloride. With some, the bath absolutely refused to tone; with others, it toned fairly well when freshly made, but would not keep. With Johnson & Matthey's best and highest-priced brand, on the other hand, the bath tones well and keeps well, the slight extra cost being more than counterbalanced by the large number of prints which can be toned in the same quantity of solution.

To tone the print it is removed from the toning bath, placed in a dry dish (preferably of glass), and a considerable quantity, say 6 oz. for a ½-plate, of the toning solution poured over it, and the dish and contents kept in vigorous motion until toning is complete. During toning, the print will assume a variety of colours, becoming first of all yellow and almost disappearing, then changing to brown, purple, blue-black and black. The point at which toning must be stopped will depend upon individual taste. Personally,

the writer tones until the more lightly printed portions of the proof just begin to turn blue. If the bath is in good order, toning takes place very rapidly, being usually complete in two minutes, and the toning bath, if a proper sample of gold chloride has been used, will keep in good working order until almost exhausted.

All things considered, it is best not to add fresh gold to an old sulphocyanate bath, but to work it until it ceases to tone in a reasonable time, and then to make up a fresh solution.

The moment toning is over, the liquid in the dish is returned to the bottle, the print rinsed under the tap, and at once transferred to the fixing bath, made by dissolving 1 oz. of hypo. in 10 oz. of water. In this it must remain for at least ten minutes, or longer if accidentally or purposely over-printed.

During fixing, the dish and contents must be kept in motion, conveniently by being placed in a large tray suspended from the ceiling by four cords, and kept rocking by an occasional push.

To succeed, it is essential to wash and tone each print separately, but several may be fixed together, provided, of course, care be taken that a sufficient quantity of fixing solution is used and that the prints are kept in constant motion. Fresh fixing solution must be used for each batch of prints.

As an alternative method of working, the combined toning and fixing bath may be used, in which case, be it remembered, the proofs must be very considerably over-printed. The best formula for a toning and fixing bath known to the writer is due to Professor Burton, viz:—

Hypo.	4 oz.
Water	1 pint.
Gold chloride	6 grs.

As this bath will not keep very long, care must be taken not to mix more of it than will actually be required. In practice, a plain hypo. solution of 4 oz. to the pint is made, and for every dozen $\frac{1}{2}$-plate prints, 10 oz. of this are mixed with 3 grains gold chloride. A convenient way of keeping the latter is to dissolve a 15-grain tube in 1 oz. of water, in which case every 33

minims correspond to 1 grain of the solid. With the combined toning and fixing bath it is unnecessary to wash the prints prior to toning, all that is required being to place each dry print separately in the solution and leave it therein until fixed and toned. Fixing is, with such a concentrated solution, complete in two minutes or less, and toning then commences, the prints becoming first yellow, then yellowish red, next dark red, and eventually brown. If removed when they have reached the latter stage, the final tone will be blue-black; if removed at the preceding ones, a shade of brown. If over-printed, they can be reduced by immersion in a fresh and plain solution of hypo.

If the prints are not vignetted they are, after toning, transferred to the usual washing-trough and freed from hypo. by a two-hours' immersion in running water. If, however, they are vignetted, it frequently happens that what should be white edges and corners have become more or less discoloured. To remove this and clear up the edges, Farmer's reducer (hypo. and potassium ferricyanide) applied with a brush was tried, but had to be rejected on account of the yellow stain to which it gave rise. On substituting, however, for the hypo. a solution of potassium cyanide, a thoroughly efficient mixture resulted, with which it is possible, not only to clear up discoloured edges, but also to improve vignetting which has got one-sided. So efficient is the mixture, that the writer has repeatedly made solid prints and vignetted them after printing by carefully applying the mixture at the corners. The following proportions work well: Dissolve 5 grains each potassium cyanide and potassium ferricyanide in $\frac{1}{2}$ oz. of water, and mix the two solutions.

After two hours in running water, the surface of each print is brushed beneath the surface of the liquid with a large soft camel-hair brush to remove any sediment which may have adhered to it, and then laid film up to dry over a line stretched across the room. The best material for this line is the stout silk-covered copper wire sold for electrical purposes. When perfectly dry, the prints are ready for mounting.

For mounting, there is nothing better than stiff and freshly-made starch prepared as follows: In a small enamelled saucepan or other suitable vessel place 2 oz. of water and bring to a boil. Meanwhile, place ½ oz. of starch in a cup with 1 oz. of water and mix carefully. When the water is boiling, add this to it in a thin stream, and continue boiling until the mixture becomes nearly clear. Finally, strain by squeezing the whole through coarse flannel.

To mount, place the trimmed, dry print face downwards on clean paper, and apply the starch paste to the back of it with the fingers, taking care to rub it well in. Then lift the print by the *edges* (not corners), place it on mount, and press in contact with a roller squeegee. If any starch paste gets on the face of the print, remove it with a fine, damp sponge. When quite dry, the print is ready for burnishing, using a rather hot burnisher and Castille soap as a lubricant.

By far the best results are obtained by enamelling the prints, an operation which is very simple if the following directions are *implicitly* followed. To carry this out, we require several pieces of plate-glass, a solution of 5 grains of white wax in 1 oz. of benzole, stout cartridge paper, cotton wool, and an old silk handkerchief which has been washed first in soda and water (no soap), then in plain water, and carefully dried.

In most large towns, what is called salvage plate-glass can be obtained from certain glass warehouses, this salvage plate being the fragments of large pieces of plate-glass which have been removed from shop windows. It is inexpensive (the writer having recently purchased several dozen pieces, a foot square, at threepence each), and if care be taken to use the *best* side, *i.e.* that freest from scratches owing to its having faced the inside of the shop, answers the purpose much better than the old negative glasses frequently recommended, and almost as well as new plate-glass at six times the price.

Each piece must first of all be carefully cleaned with soda and water, and the best side selected by inspection and repolished by rubbing it with chamois leather impregnated with rouge and water.

Every trace of rouge is then removed by friction with cotton wool under running water, and the glass permitted to dry. When thoroughly dry, a pad of cotton wool is moistened with the solution of wax in benzole, and the prepared surface rubbed over with this, and when the benzole has evaporated a clean piece of cotton wool is employed to remove all excess of wax. Just before being used, the surface is gone over with the silk handkerchief, so as to remove any dust, etc., and to give it a final polish. In the writer's practice, a long narrow shelf runs along one wall of the operating room, and upon this the enamelling glasses rest polished side out.

To enamel a print which we will assume is in the washing trough, its surface is brushed over as before beneath the water, and the print is then removed and placed on the glass, which just previously has received a final polishing with the silk handkerchief. All the prints to be enamelled are treated in exactly the same way, and when the last is on the glass, a roller squeegee is used to press each print in intimate contact with it. Personally, this is done whilst the glass is on the long shelf, the weight of the glass preventing it from shifting during the operation.

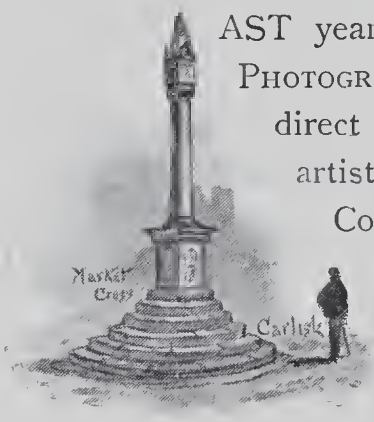
One side of a piece of cartridge paper, slightly smaller than the print, is now covered with starch, and the superfluous moisture having been removed from the back of the print with a soft cloth, the starched paper is placed over the print and both brought into intimate contact with the squeegee. After twenty-four hours, a penknife blade is inserted between the glass and the print, and the latter peeled off. Care must be taken not to get any starch on the glass, and not to attempt to remove the print until it is perfectly dry. When all the prints have been removed, the glass is ready for use again, it being merely necessary to repolish it with the silk handkerchief, but it should be rewaxed after about every sixth batch of prints. Each print is finally trimmed to the requisite size with a cutting shape and scissors, a narrow line of strong glue run along each edge of the cartridge paper, and the whole pressed in contact with the mount.

To spot the print, the colours are mixed with a little prepared oxgall, a solution of gum senegal being used instead of water. The oxgall makes the colour adhere properly to the slightly greasy surface, and the gum senegal prevents the spotting from showing up.

Alum is frequently recommended to be used either before or after fixing, but personally the writer has found it to be a needless complication. French chalk is also recommended by many writers, in place of the solution of wax in benzole, but often fails in its purpose, the print obstinately sticking to the glass.

CLEMENT J. LEAPER, F.C.S.

IN THE BORDER COUNTRY.



AST year, by the courtesy of the Editor of the PHOTOGRAPHIC QUARTERLY, I was permitted to direct attention to a few points of interest to artists and photographers "In the West Country." On this occasion I am asking my readers to accompany me in imagination further north, for a ramble "In the Border Country."

To most readers the mention of such a title will involuntarily call up visions of the old border city which, since before the days when

"King Arthur lived in merrie Carlisle,"

has occupied such a prominent position in the stirring scenes of border history. Had Carlisle, from the time when the Romans withdrew from the great wall of Severus, kept a visitors' list for the signatures of those distinguished visitors who, from choice or necessity, made the city their temporary home, what a strange collection of autographs we should have found!—St. Cuthbert, William Rufus, David King of Scotland, Henry II., William Wallace, Edward I. (who appears to have shown a marked partiality for the frontier city, and who ended his days while attempting to leave it, a few miles away, at Burgh-upon-Sands), Robert Bruce, Mary Queen of Scots, James I., Charles Edward Stuart (the Young Pretender), and a host of others whose names have been handed down to us in the history of our country, or whose exploits have been recorded in the border ballads.

In these more prosaic days there is still a fortress-like appearance about the city, occasioned by the two immense circular towers

and embattled parapets upon the site of the old citadel, by the frowning ramparts of the castle, and by the scarlet uniforms of the Border Regiment stationed there. The gates of the city, with its ancient walls and citadel, were all standing within the present century; but, excepting the western curtain wall, these have now all disappeared. The three entrances to the city were named respectively the English, Scotch, and Irish gates.

Until the close of the last century a gun was fired every evening at dusk as a preliminary to closing these gates, after which guards were mounted, and no one was permitted to enter or leave the city. Surmounting the Scottish and English gates were formerly several heads of chieftains who had aided the attempt of the Pretender in the 1745 rebellion. In the Market Place, the Market Cross,* dating from 1682, still reminds us of the stirring scene enacted in the dreary month of November 1745, when Charles Edward Stuart, the Young Pretender, was carried round it and proclaimed King of England, amidst the acclamations and health-drinkings of his army.

The castle has passed through an eventful period extending over seven hundred years, and has numbered amongst its governors military bishops and powerful barons, in whose councils the destinies of England have been deeply involved. Its battered walls have defended alternately English against Scotch and Scotch against English, and its blood-stained annals furnish many a tale of siege and privation. To American visitors perhaps the chief interest attaching to the fortress lies in the fact that it was the first English prison of Mary Queen of Scots. It is supposed that in the inner of two cells within the thickness of the eastern wall of the keep Major Macdonald, the Fergus MacIvor of "Waverley," was imprisoned. On the walls of the outer cell (which is lighted by a long loophole) are carvings of men, animals, and birds, with rude heraldic devices pertaining to some of the ancient families of Cumberland. These have evidently been cut, probably with a

* See initial letter at the commencement of this article.

nail, by weary prisoners, to relieve the monotony of their captivity.

Although the interest of the castle naturally centres in the Donjon-Tower or Keep (the walls of which range from eight to fifteen feet in thickness), yet there is much worth noting, owing to the peculiarity of its construction, in the outer gate-house known as William de Ireby's Tower. It was formerly approached by a drawbridge across the moat (which is now replaced by a bridge of

Carlisle Castle & Cathedral, from Stanwix.

stone), and, passing in, one finds oneself in a barbican, which leads up to a second archway, with a portcullis and a gate. A vaulted passage is then entered, which terminates in another gate opening into the ward. Thus, in the old days, to enter the ward it was necessary to pass over a drawbridge, through three gateways, and under a massive portcullis.

In unsettled times the lawless moss-troopers kept the castle guardians ever on the alert. Border minstrelsy relates how, in 1596, a moss-trooper known as "Kilmont Willie" was captured, and conducted a prisoner to the castle, thereby rousing the ire

of the Lord of Buccleuch, who—with true clannish instincts—threatened that, had it not been a time of truce,

> "There's nivir a man in Cumberland
> Should ken where Carlisle castell stood."

The laws of truce having been broken, however, the "bauld Buccleuch" instantly demanded the release of his follower. This demand the English Lord-Warden, Lord Scroope, declined to

accede to; whereupon Buccleuch summoned about two hundred armed horsemen, and, leaving the Scottish side, came down into Cumberland with scaling ladders and all necessary implements for the daring feat he had resolved upon. On April 13th his dauntless little expedition crossed the river Eden two hours before sunrise, and halted on the banks of the Caldew, near the castle walls. Then, to quote the ballad,

> "We crept on knees, and held our breath,
> Till we placed the ladders against the wa'."

Finding their scaling ladders too short, they made a breach in the

wall sufficiently large to admit of a few men creeping through, and these, having forced open a postern gate, admitted their comrades. The sentinels were overpowered, and with loud cries, and a fanfare of trumpets, they rushed to the prisoner's dungeon (the locality of which had been previously ascertained), and released him with the fetters still dangling from his limbs. The *ruse de guerre* was completely successful. Believing, from the din, that a much larger force was in possession, the garrison offered but a feeble resistance ; and by the time the alarm-bell was clanging and the drums were calling to arms, and ere the affrighted citizens hurrying to the castle could learn the cause of the uproar, the moss-troopers had re-crossed the Eden, and, in the mist of the dawning day, were gaily riding back in triumph to Scotland with their rescued comrade in their midst.

> "We scarce had won the Staneshaw-bank,
> When a' the Carlisle bells were rung,
> And a thousand men, in horse and foot,
> Cam' wi' the keen Lord Scroope along."

The cathedral has been sadly maimed since the surrender of the city to General Lesley during the civil war between Charles and Cromwell. In violation of the articles of surrender, the victorious troops pulled down the chapter-house and a large portion of the nave, for the purpose of obtaining materials for repairing the fortifications, which had suffered by the siege. Other wanton mischief was also wrought. The east front contains—on the authority of Rickman—one of the finest, if not *the* finest, decorated windows in the kingdom. At the congress of the Royal Archæological Institute in 1882, Mr. Freeman said of this window that "it was the grandest of its kind in England, and he supposed in the world. There was as big a window in one of the churches at Perugia, which in some points reminded him of this; but here they had the finest piece of tracery to be seen anywhere." Some curious monkish paintings of great antiquity are in the aisles at the rear of the stalls. These rudely executed specimens were for some time concealed by whitewash, and have suffered considerably

by the process of restoration. In the portion of the nave formerly used as St. Mary's Church Sir Walter Scott was united to his bride, Charlotte Carpenter.

The border country is a rich storehouse of treasures for the antiquarian, the artist, and photographer, in the form of castles, priories, and ancestral seats.

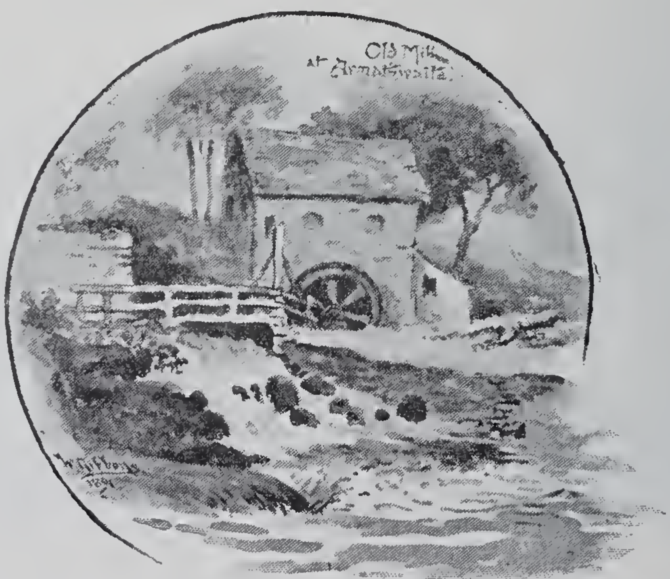
A few miles only from Carlisle are the charming woods of Wetheral and Corby, facing each other across the Eden. From the former of these an excellent glimpse of Corby Castle may be had from a break in the foliage near the bend of the river. Standing

ON THE EDEN AT ARMATHWAITE.

on the cliff, surrounded by lovely sylvan glades, with the Eden flowing below through an islet-studded channel, the towering rocks of Corby opposite, and the mansion in the background with its lions—the crest of the Howards—surmounting the parapets of two sides, we obtain a view long to be remembered. The rocky banks, luxuriantly clothed with varied foliage, rise almost abruptly from the Eden to an impressive height, and forty feet above the river are three caves hewn out of the perpendicular face of the cliff, formerly approached only by a ladder from above, known as the cells of St. Constantine. In the vicinity, but not sufficiently near to mar the beauty of the scene described, the river is spanned by a railway viaduct one hundred feet high. Of the priory of

Wetheral little remains but an embattled tower and archway. The quiet little church should not be overlooked, as it contains an interesting memorial of a Mrs. Howard of Corby, who died at an early age. The marble group of the young mother, infant, and a spiritual being bending over the new-born babe, is regarded as one of the finest specimens of work from Nollekens' chisel.

Further attractive subject-matter for the camera may be found in the neighbourhood of Armathwaite, about which spot the river Eden presents us with scenes at once varied and picturesque.



Widening out in one place into a broad lake-like expanse it glides peacefully on its way, while a further reach of the river reveals a foaming cataract noisily resisting the opposition of a rocky bed, whose crags whirl the stream into seething eddies. During the writer's visit, in the early autumn, all nature seemed exulting in the genial sunshine. From the tumult of the foaming waters the fish were making repeated and desperate efforts to leap up the fall, only to be flung back again time after time amongst the rocks below; in the branches of a tree overhanging the stream a nimble squirrel frisked merrily, and, round and about, bird and insect life seemed awakening to abnormal activity. A picturesque little subject for a snap-shot is close to the fall. The old water-mill, of

which a sketch is given, composes so perfectly that nothing need be added, nothing left out. Even the fallen timber lying near seems placed just where an artist would wish to have it.

At and around Wreay some good subjects, of a rural character, are obtainable.

The most perfect type of the border fortress which remained to us prior to 1843 or 1844 was Naworth Castle. At the period named a disastrous fire rendered restoration to some extent necessary, and thereby somewhat diminished its interest. Its feudal aspect and ancient furniture recalled the times of Lord

William Howard, the Belted Will of the "Lay of the Last Minstrel," who, as Warden of the Marches, maintained a garrison of one hundred and forty men, and held the lawless borderers and moss-troopers in check. The restoration has been carried out as far as possible in keeping with its ancient characteristics. The banqueting-hall is a noble apartment, with its fine open timber roof, spacious chimney-corner and ingle nook, its old family portraits and ancient armour, and last, but by no means least, its four heraldic monsters (the red Dacre bull, the gryphon, the dolphin, and a fourth creature which is somewhat of a puzzle), which form such a prominent feature in the hall. No reader of the QUARTERLY having a camera on the spot would care to leave without a memento of this superb interior. The castle is built

upon a site apparently destined by nature for a stronghold; and, to quote a seventeenth century writer, "around it were pleasant woods and gardens; ground full of fallow deare, feed on all somer tyme; brave venison pasties, and great store of reed deare on the mountains; and white wild cattel with black ears only, on the moores; and black heath-cockes, and brone more-cockes, and their pootes."

Before leaving Naworth attention should be directed to its courtyard or quadrangle.

Romantically situated in a beautiful valley but a short distance from Naworth is a venerable ruin which should on no account be missed. Whether the visitor be artist, architect, photographer or antiquarian, he will find in Lanercost Priory a relic of the past of more than common interest. It would be useless, in the limited space at disposal, to attempt a description of the place, but it cannot be passed over without a word as to its most attractive features.

In the first place the visitor will be struck with the picturesque character of the old ivy-clad gateway, and the view of the abbey seen through the arch before entering. This view appears to be a favourite one with photographers. The corbels supporting the groining of this gate-house should be noted. The architectural features of a large portion of the building now remaining are of the best period of the Early English style, proving that very little of the priory was erected in 1169, the date of its consecration. The structure appears to have been raised by degrees as funds and time permitted. Most of the earlier parts are of transitional character, and, after a cessation of building operations for a considerable time, a fresh start seems to have been made about 1250, when a marked change occurs as a natural result of the change of style which would have taken place during the interval. It is most interesting to trace—especially in the clerestory—the gradual development of the Early English style as the new fashion progresses towards the perfection it ultimately reached before giving place to the "Decorated" features which succeeded it. A feeling

for variety, both in the general composition and in matters of detail, characterises the ruin. On one side the nave has no aisle ; on the other side there is a spacious one. The transepts also vary, and in the choir the same love of variety is strongly accentuated.

In 1280 the priory was visited by Edward I. and Queen Eleanor ; and shortly afterwards the place was twice burnt and plundered by the Scotch within a period of about seven years. Edward I. stayed a second time at Lanercost in 1306, remaining on this occasion from Michaelmas to Easter owing to ill-health,

and from his retreat dated many documents of national importance. Shortly after this Robert the Bruce, with his army, stopped here for three days ; and a few years later David, King of Scotland, with his army, came down upon it, and the glory of Lanercost from that time departed.

Coming now right up to the border let us visit the scene of Young Lochinvar's dashing exploit, Netherby Hall. It will be remembered that—

> " He swam the Esk river where ford there was none."

In these days he would have found a light bridge to conduct him safely over. The Esk flows between the church and the Hall. The park is beautifully wooded, the Hall being hidden from view

as one approaches from the river, by the dense masses of foliage around. The peaceful little church is built, as indicated in the sketch, in a style unusual for a village. Scotch-Dyke is the nearest railway station, and within a few yards of the iron-road the frolicsome rabbits, by the half-dozen together, dart hither and thither as though the shrill whistle had never disturbed the quietude of their abode.

A short distance from the banks of the Solway Firth, on the Scottish side of the border, is the quiet little village which, from about the middle of the last century to about the middle of this, was the scene of so many thrilling escapades. To the Marriage

THE SCOTCH COAST FROM SILLOTH.

Act which came into force in 1857, Gretna-Green owes the loss of its prestige. The twenty-one days' residence in the parish required of all but Scotchmen was practically the death-blow to Gretna-Green marriages. The days in which the knot was hurriedly tied over the blacksmith's anvil for a fee ranging from £100 to a dram of whisky may now be reckoned among the past.

From the port of Silloth, a little north of Maryport, an excellent view of the Scotch coast, looking in the direction of Dumfries, is obtainable in clear weather. In changeable weather the glimpses, across the Solway Firth, of the sunlit slopes of the Scottish hills and the alternating gloom of the valleys will furnish excellent opportunities for instantaneous work.

Considerations of space forbid extension in the direction of

Berwick, and also prohibit even brief descriptions of "Long Meg and her daughters," the famous druidical circle near Little Salkeld; or of the trail of the Roman Wall, with its camps and mile castles, a description of which stupendous works would monopolise another entire article. We must also reluctantly pass over such subjects as the characteristic fortified church of Burgh; the pillar on Burgh Marsh, which marks the spot where Edward I. died; the neighbouring "Sandysike," where the *Jumping Jenny* of "Red Gauntlet" ran her cargo; the ancient church of Over Denton, where lies buried Meg of Mumps Ha' (Margaret Teasdale) of "Guy Mannering" fame; Sewingshields Castle, wherein King Arthur and his Queen Guenever are said to be enchanted; and the Busy Gap, the pass most frequented in mediæval times by freebooters, or "Busy-Gap rogues." But it is hoped that the little which has been imperfectly dealt with may prove sufficient to convey a general idea of the nature of the subjects awaiting the brush and the camera In the Border Country.

WILLIAM GIBBONS.

HANDS OFF!

MAN is constantly striving to imitate the infinitely great by various arrangements of the infinitely little. A painting is but the production of much training in small matters, controlled, when the training is perfected, by a mind which, however talented, without it would not be able to produce the painting at all. Not satisfied, too, with the emotions which reality will cause, he seeks to make a counterfeit presentment which will produce the same effect in a small way as the reality, or which will raise other emotions than did the original, caused by something which his genius has infused into his work. But man, being a copyist and not a creator, finds there is a limit beyond which his feeble efforts will not take him with success. Sometimes it is the hardness of downright impossibility which stops him, at others it is only his good taste which prevents his work becoming an example of all that a true artist should avoid.

Turner was a painter who, with a wonderful daring, attempted more than any other man who ever lived to translate a good deal more than mere form and colour; with how much success all people are not agreed. Do we, when we look at his picture, "Wind, Steam, and Speed," really fancy we hear the rush or feel the draught of the express train as it sweeps past with a cloud of dust behind it? Who can paint wind? The effect of it is shown by bent trees, agitated skirts, and umbrellas turned inside out, it is true; but we cannot feel it. We cannot gather its story except from its own whisperings. Perhaps it was born in the vortex of an Atlantic storm, and screamed its impulsive way across the waves through the dark night, snatched the spray from their tops only to throw it again in the trough, and whistled with devilish glee as it flew through the rigging of some labouring ship. But

dawn comes, and, only somewhat pacified, it is now careering over the grassy cliff-tops, ringing the bluebells with a rough and wanton hand. It is bringing the healthy blood into the cheeks of the shepherd as he stands on the downside and looks into its eye. It has blown the cap off the head of the little chap who is carrying his father's dinner to him out in the fields, and has rumpled his hair, and given him such a run that his little lungs are working like a steam-engine. It leaves him lying on his back on the grass to get his breath again, and has sped away down the valley to shake the acorns from the oaks, and to make the old dame's cottage fire draw so badly, that—"drat it!"—the room is full of smoke, so that you can hardly see those wonderful pictures on the wall, or the more wonderful wool-work mats under—most wonderful of all—the china ornaments on the chimney-piece. It moans in the dusk round gables and roofs, and in the night makes nervous souls quake with dread at the sound of ghostly fingers tapping on the window-pane. Once more comes the morning, and the golden rooster on the church spire, which has caught the earlier beams of the rising sun, yields creakingly to its now subdued touch. Then it drops down among the gravestones, and blows the dust out of the names chiselled upon their mossy surfaces. In the next field it carries about, to the farmer's sorrow, the feathery seed of the obnoxious thistle; and as the day gets warmer, with waning strength invades a garden, where it goes among the flowers and swings the censer of their scents upon the air. But now at last it dies,—as coolingly and caressingly it creeps into the dark hair of a maiden dreaming day-dreams in a hammock swung in the grateful shade of two chestnut trees; and its last breath is a passing kiss upon her cheek. Alas that it should be so! but nathless it is true that wind is neither paintable nor photographable. Nature says to the painter and photographer, "Hands off!" not roughly, it is true, but because of the impossibility of the thing.

Sad to relate, the photographic artist has constantly to keep his hands off, and is always finding he may not touch many an effect which the painter can revel in. To tell the truth, to any one who

loves the beautiful, and longs to make pictures of it, and who at the same time lacks the ability of the painter, photography is a source of constant disappointment. So long as he confines himself to the picturesque he will be satisfied, but should he meet something grand, or have the good fortune to witness a combination of sublime effects, then he had better leave his camera in its case, and spend his time more profitably by watching instead of photographing, or rather trying to photograph.

Have you not seen the sun go down behind a great black cloud, and then, through a window made by a rent in its murkiness, cast the beams of his gigantic search-light around, to gild with momentary gleams of gold tree-tops and hillsides? The light beams wane in intensity as down he drops, not staying so long as those fiery flashes flung against the obscured west, which look like a yellow and somewhat stable kind of lightning. Fiercely they glow with a warm life, but a life ebbing even as they glow; fainter and fainter they wax, and more and more suffused grows the sky above the cloud bank with mellow hues. But even that is only the one gorgeous glow of a great pulsation of transparent colour which weakens gradually like a long-drawn-out sigh, as the stars strengthen and multiply, and the silver edge of the crescent moon sharpens keener and keener against a blue-black background. Did you not know that photography must keep its hands off the picturing of such things as these?

Have you ever been roused by the whistle of an early rising blackbird, opened your window, and looked out into the east? There was a ruby canopy hung in the orient, and here and there you might have counted as many as seven, perhaps eight, bolder stars that would not yet efface themselves until a nearer coming of the Lord of Light. But one by one even they slink away in face of the fast-diffusing light, while the red becomes more golden, and our blackbird's solo is taken up by dozens of trilling throats in a great cheerful chorus—the morning hymn of welcome to the kind, warm sun. And now, as if in response to this song of Nature awakening, with one great beam shot up into the few light clouds

that await him in his path like earlier rising aides-de-camp, he comes with a sudden bound, dissipating dulness, putting a gloss upon the foliage and a brightness on the grass, melting the mist which obscured that bit of distance you now for the first time get a glimpse of between the trees, and silencing the birds. The thrush ceases his song, elevates the feathers on the top of his head, and sits contemplative for one instant, a soft feathery ball, and then suddenly pulls himself together, and flies down on to the lawn for his breakfast. The scents of the morning air, sweet and indescribable,—perhaps that of pine trees predominating,—insinuate themselves upon the senses, but grow fainter and fainter as the sun rises higher, and with greater determination sheds his rays upon the earth. Another day, hot, garish, matter-of-fact, and—*photographable* has commenced. Man ceases dreaming, and goeth forth to his labour again.

Those dreams indeed! What a solace to the soul that experiences them, and what a pleasure they can be made to others when woven into something tangible by a master of prose, poetry, or painting! Some poor deluded mortal who thinks the woman he loves loves him, and dreams such sweet dreams, until at the end of a few hours, maybe, he is undeceived, and his castles fall about his ears, has not lost anything by his self-deception, unless it be his peace of mind. And what is the loss of that, if he has been blissful, perfectly, for a time? Be sure he will dream those dreams again, until, joy for him, they shape themselves into realities, never, never to be dissipated back into shadowland, or—until, pity for him, they are destroyed by the cold breath of undeniable fact, and he has nothing left but the sweetly-sad comfort of lingering dreams *of* dreams. Another—shall we indeed call him deluded?—shuts his eyes deliberately to facts which he knows no looking at, nor thinking over, nor busying about will ever remove, and fills his mind with fancies and anticipations. Surely life is better for a little dreaming, and for the ignoring of facts which, encouraged, only too readily become damning tyrants. There are some things had better never been known; never been taught. There is such a thing as a wise

ignorance, which is far wiser than the folly of wisdom. A man may be happier with a mind filled with what the world would call unprofitable thoughts than if he were worrying about something which no amount of thought will overcome. Amidst the beautiful in Nature he may lose his memory in rapture, and feel the poetry of the sublime. But unfortunately, there is that about a camera which sometimes tends to destroy that poetry, which renders its presence in the very best of scenery out of place, and jars upon the refinement of the atmosphere. The painter's tools do not do so; the warm colours upon the palette, and their gradual transference to a growing picture by a hand suggestive of anything but of a mechanical nature, seem to be in harmony with the surroundings. There is something, too, about the manner of the painter which prevents him from becoming a blot upon the landscape; he is presumably a poet in thought, and undeniably a *dilettante* in his method. But the photographer, prosaic and business-like, comes rushing in upon some tremendous scene, and begins hurriedly to unpack his machinery while yet the light serves him. His paraphernalia abound largely in screws and things rotatory. He goes through the same process as on hundreds of previous occasions. He looks above him to gauge the intensity of the light, and around him to judge of the depth of the shadows; and when he has made his exposure, he registers the view in a ruled and printed note-book, and hurries off to fresh scenery. Now it is not suggested that photography, as some maintain, is *purely* mechanical, but it certainly is mechanical and anti-poetic in its workings as compared with painting; and in the midst of some scenery, at any rate, a small voice would seem to say to the camera man, "Hands off!"

Were photography purely mechanical, it would present no scope—as it does—for the imagination or fancy of the operator. It is true that flights of imagination on the part of the photographer cannot be very bold or striking—in fact, they must perforce be but flutterings rather than flights; but so long as they are confined within proper limits no one can find fault. It is when imagination

soars too high in photography that its appearance becomes ridiculous—perhaps worse—and as graceful in its operations as a swan on the walk. It is not usual to attempt the representation of some historical scene by means of the camera, although such a thing has been done. It is no shock to our sense of the fitness of things to look at a *painting* of the Virgin and Child, because we know the artist saw them in his imagination and placed his view upon the canvas. But were a photographer to attempt to picture the same, we should simply contemn the thing as a pitiful imposture, at which our common-sense revolted, because we know it is utterly impossible for him to employ his camera on such a subject, and that the figures are simply masquerading for the occasion. Imagination in photography becomes worse than ridiculous when we see it, as we might have done in the 1891 Pall Mall Exhibition, employed in depicting "Prayer," and such as a mourner kneeling beside a newly-made grave. Now it is perfectly clear that the feeling shown by the figures must be either real or sham. Can it possibly be *real*? Is there a man so depraved as to bring his lens to bear upon actual grief, and to invade the sacred surroundings of supplication? He need not even be a Christian to revolt at once at such ideas. No, the pictures are shams, and not only shams, but tamperings with what good taste and decency of feeling say most emphatically the photographer must keep his "hands off." There is, in fact, hardly an exhibition of the Photographic Society which does not contain some namby-pamby examples of bad taste, such as a kneeling child with its hands together, entitled, perhaps, "Our Father," or a couple clasped in an embrace, representing the sentiment "Till death do us part." The camera is decidedly *de trop* on such occasions.

Is, too, the indiscriminate use of the detective camera to be encouraged? Is it not calculated to become a nuisance, and to bring contempt upon a worthy pursuit? It might be an exaggeration to assert it is already an evil. But decidedly it might become one if brought to invade the privacy of a man's daily life, or if used to surreptitiously steal views of his most innocent

occupations. Of course if he be a public character, then he has no right to complain if his movements *when* in public are not only catalogued and described in the newspapers, but also instantaneously photographed by the owners of detective cameras. Public men and women indeed find it hard to escape the ever-watchful eyes of their inquisitive fellow-beings, and difficult in the extreme is the search for and preservation of a little privacy and seclusion. Do not then add another source of annoyance by following them on all occasions with material for a hundred or two "shots." The fierce light that beats about the throne should not induce the ardent amateur to fancy its brightness would excuse his dodging behind the bushes in the gardens at Osborne, until his pertinacity had secured what eventually develops and prints out as an execrable caricature of his Queen.* The most enthusiastic admirer of Mr. Balfour, whose admiration for his idol might only be equalled by his devotion to his snap shutter, would be doing the First Lord of the Treasury the greatest favour in the world if he would keep his finger off the trigger when following the Right Hon. gentleman over the links on one of his very "off" days. The doting disciple, too, of Mr. Gladstone, who, not content with hugging to his bosom the real and original chip, aspires also to the possession of a portrait of the G. O. M. standing with axe raised to do deadly injury to some sapling in the woods about Hawarden, will not be shooting fair game surely should the woodman's weapon be blunt and his temper sharp. Public men and women when such are legitimate material no doubt, but "hands off!" when they are out of harness.

There is so much that photography *can* do, and so truly and sweetly too, that it is a pity there should be a tendency anywhere to present it in an ugly garb, making a guy of it. Photographing is comparatively a new power rather easily attained, and naturally that power in the possession of the multitude is too apt to be abused. It is like a new toy in the hands of a child, and at first

* Vide *Amateur Photographer*, October 9th, 1891, p. 251.

is worked to death on all occasions, and in any and every place. Some will grow tired and discard it for other pursuits, others will be led to take a deeper interest, and to use it in a more serious manner. By-and-by, when the present state of ebullition is over, things will settle down, and photography take an improved and better understood position. Inside the ranks of those initiated into its mysteries there are divisions and contentions. *That* will always be the case. But the causes of those divisions will not then be as one is now—namely, the question whether photography may be called an art or not. In fact, any one can see that it is becoming more settled every year. Outside, on the other hand, the uninitiated look upon photography as something useful, and regard the attempts of the would-be artist to make it more than that with a good-humoured toleration. When the workers know what they want to produce and how to produce it, then will the result of their labour be recognised and appreciated in full. If they *don't* believe photography is an art, and if they neither *want* to produce something artistic nor know *how* to, well, then, the public *certainly* will never say photography is an art. But if, as we are sure they will, the general body of workers, without questioning the fact, would all lay themselves out to exemplify their faith in their pictures, really wanting to and knowing how to, then perforce the position of the art of photography would be assured, —no thanks, however, to the detective camera.

Who are the men who seek to make an art of photography? They are those possessing an artistic knowledge and instinct, yet lacking either the ability or the energy to acquire the technicalities of painting. They find in photography—so much more easily learnt—a means of expressing their taste, although only in a small way. They are bound to be disappointed at the incapacity of the means at their disposal, and as their minds expand and grow more appreciative from contact with Nature, will be constantly chafing at the way in which their hands are tied. See those wild clouds of wondrous tints stretching themselves out from the gathering gloom in the south across the twilight tones of

the western sky, until they are lost in the duskiness of the north. Could you paint, you might give vent to your feelings by sketching them. As it is, you sigh at your inability to preserve their phantom shapes and the lovely colour of the heavens except in your memory; and there, maybe, the shapes become more phantom still, and the colours less vivid. You may go down some valley in the autumn, between the foliage-covered hills, where elm trees all shimmering pure gold stand out against black-green yews, where the silver birch, silver no longer, has been conjured by the fairy godmother, so that now it seems sprinkled with gold-dust. You may feast the eye on a gorgeous blending of russet, and olive, and brown, and yellow, and tints indescribable. It would puzzle the painter to set his palette here. Does the photographer think he could do better than the painter?

H. Ernest Murchison.

CLOUDS IN LANDSCAPE NEGATIVES.

THE subject will at once be clearer if I call it a negative in which both the landscape and cloud have been developed to the same pitch or printing density, and that, the correct one.

Is this possible?

I feel I cannot say no and be quite correct, because this has been done; but I feel certain that it was more the result of chance than of deliberate work. My intention, however, is not so much to dispute the possibility of obtaining the sky on the same negative as the landscape, as to question the use of doing so.

Ever since the birth of Photography it has been its misfortune or fortune to be hurled at artists' heads for some point—for some lesson it was supposed to teach them; and nearly the first, perhaps the first of these points, was the truthfulness of the sky, or shall we say the want of sky, in landscape photographs. Of course, there can be no doubt that, if the actinic power of the light were all that had to be considered, the white patch which represents the sky in so many photographs would, although hundreds of times away from, be nearer perfection than the modified tones which result from printing in a sky; but it must be remembered that nature's brightest light is the very source of light—the sun itself, while ours is but the reflection white paper will give *of the light it is exposed to.* If photography were carried out on the doctrine of which I have spoken—even granting that the relation of density of landscape and sky were correct, which they are not, for an exposure of a fraction of a second will give equal density in the sky with an exposure of ten, twenty, or thirty times as long, while the density of the landscape is altogether different with these different exposures—even granting that they were correct, the print would have to be exposed until the sky was printed to the correct depth,

Development by the brush may be advocated, but of the numbers of plates and brands of plates I have tried, few have stood the application of the brush without the film tearing or frilling in all sorts of places. Besides, there is the horizon line to contend with, and this is no easy matter, for the light is not very bright and the action of the developer is extremely rapid.

Granted again that you have a negative in which there is a sky and landscape—it is, of course, out of the question to suppose that you have obtained a proper relation with regard to density of the one to the other. Possibly, you find your sky has printed to the required depth first, then you go to the trouble of masking it in some form, and that, when it is in position in the printing frame. Use what you like for this, and it will not be as well done as if it were done when not in the printing frame. In saying this, I, of course, do not take the case of a person who has the time to stay by his printing frame all the while the exposure is going on, and, when necessary, mask by use of a red cloth.

It will not require much thought to see that unless sky and landscape be of the same printing density, masking one or the other will at one stage of exposure be absolutely necessary.

What have you for your trouble ? Mostly excitement, the remainder print ! Just realise the amount of trouble you have been to, and the amount of useless risk you have incurred ; and yet there are some gentlemen who would place this against the simplicity and certainty of a sky on one plate and a landscape on the other. Except on the matter of principle (namely, the objection to use combination printing), the procedure is, to my mind, nothing short of absurd. Principles we must respect, and to those gentlemen who hold that combination printing is wrong, we can do no other than say, do as well as you can with the clouds in the landscape negative ; but let me point out to them that the defects of photography should be either remedied by photography or left alone. That it is admissible to take a print with a white patch for the sky and tone it down—to take a particular case I have in mind—to tone from dark at the top through the various shades to white on

the horizon line, without the intervention of a negative giving the result, in fact with merely an exposure regulated by a piece of card-board, and thus produce an evening effect, I can never allow.

Pure photography is, or should be, our object, and to correct a defect solely by photography cannot surely be called anything else. Our skies receive too long an exposure for the landscape, and we therefore take them separately and print one after the other. There is no intervention of any other substance in this case, and therefore what can the result be but photography pure and simple ?

Wherever the sky is suitable to the landscape, it should be photographed at the same time, but on another plate. If the sky is not suitable, take your landscape if you like, but wait for your sky, and if possible take it from precisely the same point of view as the landscape. The printing operations will be much facilitated if this be done. There can be little doubt that landscape and sky on the same negative is a mistake. Chance is after all but a poor companion to place your trust in, and into what could that element enter more than the delicate salts which we are treating, when that treatment is carried on in such a haphazard way ?

The attempts in the direction indicated serve very well to produce a thin deposit in the sky of the negative with the resulting dirty print. But to produce skies ? No.

Before this can be done, we shall first have to learn to gauge exactly the difference of exposure necessary for landscape and sky, then to make a shutter which will adapt itself to all the ups and downs of the horizon line and to the difference of exposure. Failing this, we must make such advance or retreat in photography and the support of the image that our highest light shall be as bright as day, our darkest black the exact opposite. Truly a fanciful idea, but no more so than that we shall ever be able to produce the shutter which shall do all we require of it, or that clouds will be produced on the same negative as the landscape, the resulting print from which shall equal, *with the same amount of labour*, that produced from two negatives. GEORGE H. JAMES.

LIGHT AND SHADE.

THE study of light and shade is of paramount importance to the artist and photographer. Composition teaches us the building up and construction of a picture, but it is the lighting of it that gives it its expression. One of the chief difficulties the photographer has to contend with is the suppression of unnecessary or undesirable objects and detail. The artist simply omits them, and chooses his time of day when the shades of evening give a breadth and solemnity to an otherwise ordinary view, or he catches the cloud shadows sweeping over the landscape and across the road, and by this means secures truth and variety; and the photographer must do the same. He must watch and wait; his eye must be ever on the alert for combinations and effects; he must choose his subject and his time, and come again and again, taking cheerfully the spoiling of his plates, if so be he may obtain the desired result.

Of late years we have heard a good deal about "values," a word borrowed from the French, and intended to express the relation of the light and shade of the different planes of an object or view to each other. Now, it should be observed that there is no such thing as *correct* light and shade either in painting or photography, and that is because the means at our command are not adequate to express the enormous scale of nature. For instance, flake white compared with sunlight is a dark grey; and our deepest black is many degrees lighter than the blackness of nature. The artist has therefore to work by an artificial scale, and his representation of nature's scale of light and dark is but a compromise and suggestion at the best.

This would be difficult enough if the world were a black and

white world, but the colours of nature complicate the problem enormously.

The following scale gives a fair idea of the luminous power of the colours of the spectrum, taking 1000 as the maximum.

Dark red	0	Green	480
Red	32	Blue	170
Bright red	94	Indigo	31
Orange	640	Violet	6
Yellow	1000		

The artist, therefore, has to consider and allow for these differences of luminosity in the coloured world; but there is a further difficulty yet. Pure colours are rarely met with in nature, except in the foreground, but are largely mixed with white light, and are further complicated with reflected lights and atmospheric conditions. But it is this very complication that produces the subtle beauty of nature's colouring. It is not in the gaudy primary or secondary colours that this beauty is chiefly found, but in the quiet, subdued harmony of the tertiary colours, the russets, the olives, and the citrons. And these tertiary colours pervade Nature in her every phase, and the more delicate the eye becomes, the more it will take delight in these refinements of colour. Mr. Field, in his valuable work on colour, says with great truth: "To understand and relish the harmonious relations and expressive powers of the tertiary colours requires a cultivation of perception and a refinement of taste for which study and practice are necessary. They are at once less definite and less generally evident, but more delightful, more frequent in nature, but never in common art, than the like relations of the secondaries and primaries."

From the above it will be seen that the artist has first to adapt his narrow artificial scale to the vast scale of natural light and shade, and then he has to take note of and allow for the variations produced by the endless play of colours acting and re-acting upon each other, and perpetually altered by changing atmospheric conditions.

Nothing but years of unremitting study, combined with great

natural abilities, will enable the artist to grapple with the difficulties above mentioned, which, though very great, are not insuperable, as the beautiful and truthful works of great painters abundantly prove.

The photographer has his own further difficulty to contend with —viz., the variations of the actinic power of light, which is not commensurate with the visual power. To some extent this can be overcome by the use of orthochromatic plates and coloured screens, and the colours of nature represented in truer value as to tone.

The above remarks will show the difficulties attending the production of pictures in black and white; and though great theoretically, yet in practice it is found, from the close study of nature and the works of great artists, that very fair reproductions in light and shade can be obtained. For instance, studies of still life—and these are of especial value to the student—can be produced with marvellous fidelity; and sunlight, moonlight, and atmospheric effects can be *suggested* with great success.

In his valuable work on Light and Shade Mr. Prout says: "The characteristics of moonlight are the essential requisites of good effect, such as concentrated brilliancy with smaller glittering lights, large masses of shadow and a point of light opposed to the deepest shade, while all the minor details become invisible, and sink into the simplicity and grandeur of the whole."

As photography, as yet, does not enable us to take effective views by moonlight, we must be content with studying the effect in nature, and endeavour to imitate it with brush and colour. This, and the careful study of still life, will be found most useful, and will educate the eye to appreciate the true "values" of the various planes. Rules are of little or no value; the secrets of nature and art are only to be learnt by careful study and observation, and also by comparing and contrasting the works of great painters, especially those of Rembrandt and Turner. Much, too, may be learnt by the careful study of the lighting of natural objects, and the time of day and atmospheric effects.

In early morning and at twilight the landscape will assume a

breadth and repose which will hide many objectionable details, and greatly assist in the production of artistic work. Again, on cloudy, windy days, the broad shadows sweeping over the landscape are suggestive of most poetical effects. The photographer who refuses to stir out on a windy day will never produce artistic work, for, as Dr. Emerson well says, "Æolus is the breadth of the life of landscape." Turner on one occasion, when asked by a brother artist what to paint, replied, "Paint your impressions"; and here photography is of immense use, as it can seize an effect of nature in the twinkling of an eye, and can catch the wave in its fall, or the bird on the wing, or the shadow sweeping over the mountain side. An artist has to rely largely on his memory; and nature is so various in her effects and changing lights that he is constantly tempted to change his purpose, instead of relying on his original impression. To catch these fleeting beauties of nature, a hand-camera is of great assistance, as it is always ready at "full cock," so to speak, and is an inestimable boon to the artistic worker. Every artist and photographer should master the working of a hand-camera, as it is most useful as supplementary to his ordinary work; but like every other good thing, it requires patience and practice before the best results can be obtained.

Next to the study of nature should be placed the study of the works of the great masters, and sketches in black and white of their arrangement of light and shade will be of the greatest use. Sir Joshua Reynolds adopted this plan on his travels through the foreign galleries, with doubtless great advantage to his work, and in his notes upon Fresnoy's art of painting he relates his method of procedure as follows:—

"The means by which the painter works, and on which the effect of his picture depends, are light and shade, and warm and cold colours. That there is an art in the management and disposition of those means will be easily granted, and it is equally certain that this art is to be acquired by a careful examination of the works of those who have excelled in it.

"I shall here set down the results of the observations which I

have made on the works of those artists who appear to have best understood the management of light and shade, and who may be considered as examples for imitation in this branch of art.

"Titian, Paul Veronese, and Tintoret were among the first painters who reduced to a system what was before practised without any fixed principle, and consequently neglected occasionally. From the Venetian painters Rubens extracted his scheme of composition, which was soon understood and adopted by his countrymen, and extended even to the minor painters of familiar life in the Dutch school.

"When I was at Venice, the method I took to avail myself of their principles was this: when I observed an extraordinary effect of light and shade in any picture, I took a leaf of my pocket-book, and darkened every part of it in the same gradation of light and shade as the picture, leaving the white paper untouched to represent light, and this without any attention to the subject or to the drawing of the figures. A few trials of this kind will be sufficient to give the method of their conduct in the management of their lights. After a few experiments I found the paper blotted nearly alike. Their general practice appeared to be, to allow not above a quarter of the picture for the light, including in this portion both the principal and secondary lights; another quarter to be as dark as possible; and the remaining half kept in mezzotint or half shadow.

"Rubens appears to have admitted rather more light than a quarter, and Rembrandt much less, scarce an eighth; by this conduct Rembrandt's light is extremely brilliant, but it costs too much; the rest of the picture is sacrificed to this one object. That light will certainly appear the brightest which is surrounded with the greatest quantity of shade, supposing equal skill in the artist."

Although we said above that rules were of little use, meaning thereby hard and fast rules, still there are certain broad principles which should be thoroughly understood; for instance, the lights should not be scattered all over the picture, or the idea of unity

and breadth will be destroyed. "The opposite quality to breadth, that of division or scattering of light and colour, has a certain contrasting charm, and is occasionally introduced with exquisite effect by good composers. The broken lights in the works of a good painter wander like flocks upon the hills, not unshepherded, speaking of life and peace; the broken lights of a bad painter fall like hailstones, and are capable only of mischief, leaving it to be wished they were also of dissolution" (*Ruskin*). Breadths of shade should, if possible, be linked together by other accidental shadows; and this recalls the old story of the artist who was asked what the dog was doing in his picture: "Why," said he, "he is carrying the light and shade through it."

Again, if there is a leading idea or object in the picture, the light and shade should be arranged so as to display it most effectively; and yet it must be so insensibly linked together with the rest of the picture as not to be obtrusive. All this is difficult enough; but as the artist progresses in his study of nature and art, new beauties will gradually unfold themselves, and every success will be a stepping-stone to greater success, and every failure but an incentive to future effort. To the artist who works in this spirit, either with the brush or the camera, every picture will present a new and interesting problem, new difficulties will but incite him to further effort; and as his skill increases and his study of nature leads him to understand and interpret her most subtle moods, he will perceive that the beauty of nature is inexhaustible, and that all human effort and work must fall infinitely short of that ideal to which he may never attain, and that life itself is all too short to record even a fraction of the beauty and mystery of nature.

John Andrews.

PHOTOGRAPHY NOT ART.

LET us, lest we be misunderstood, preface our article by acknowledging without stint the great and invaluable uses of *scientific* photography—that is, photography taken with the best corrected optical instruments that give mathematical reproductions of objects before them—reproductions scientifically true in *some* respects, but not in all; *e.g.*, false in colour translation. No doubt science will remedy these defects, and then we shall have an invaluable *machine* by which *impersonal* drawings can be made. The uses of such drawings it were superfluous to consider; they are already widely known to many, and their increased usefulness can be trusted to gain ground without any advocacy. But it must never be forgotten that such mathematical plottings of persons and things are not true in the sense that they reproduce objects as we see them. I first called attention to the fact as regards form and perspective drawing, and subsequently, in conjunction with Mr. T. F. Goodall, published a paper on the subject. Our observations have, in many cases, been corroborated by one of the greatest living psychologists; and one or two of the results, we have since found, were previously discovered by another psychologist. In addition, a well-known teacher, the author of a work on simplified "perspective," has accepted our pamphlet, and intends withdrawing his work. Our investigations easily explain why photographs so often do not resemble the people they are meant to represent, why landscapes are nearly always so disappointing and petty, and why architectural photographs are useless to the seeing draughtsman, as Mr. J. Pennell so ably pointed out.

For the advantage of those who have not read our paper, I may briefly say that perspective drawings (and such are correct photographs) are useful purely as "measurements"—as surveys,

in fact; for topography, then, photography is invaluable. In the matter of textures photography sometimes serves—sometimes other methods are truer. But in most transient landscape effects photographs are absurd. Look at the full moon just rising, and take a photograph of it, then compare the proportion of the moon to the rest of landscape; the photograph will give an absurdly "small" impression of the scene.

This brings us to the subject of photography and art. It has often been asked, "Is photography an art?" We answer, "*No*," and with Mr. Pennell agree that "it can never be an art."

It is amusing to watch the wrigglings of various vain persons who would be known as "artists," and yet are living on from day to day practising some other trade or profession, persons who—provided photography were an art, and all that some say of it—could never be classed as anything but "amateurs." They belong chiefly to a body of well-meaning persons well known to neural pathologists—a class that fills our galleries and libraries with rubbish done at their own expense. But there are some who really are puzzled to know why photography is not an art.

We will endeavour to enlighten them. Let us assume we are going to prove to the world photography is an art; that the most fastidious and critical judges of the period (artists of all schools), have assembled for us to demonstrate to them that photography is an art.

We begin then the "proof" (?).

First, we must select a subject, a real objective picture in the world before us. We select a landscape, say, that experience has taught us would make an artistic painting. We may in that act of selection prove we have artistic judgment. We will assume we have proved this fact. Next we arrange it on the screen, focus it as we like, place our diaphragm in the appropriate slit, and put on the cap—all ready to expose. No special photographic knowledge is required for all this—any artist amongst our judges could do the same thing—his purely *artistic knowledge* would tell him when the focus was right for his desired

effect. *Up to the taking off the cap, then, nothing is required but artistic knowledge* (saving a trifle of mechanical knowledge learnt in a *few minutes* by any intelligent person). The person who really wishes to arrive at an impartial judgment must hold *this fact closely.* All done so far has nothing to do with photography, but with art; as for example, any great painter might come and do all this, and then any operator could take the picture. Whatever artistic value it had, would of course belong to the artist who selected, arranged and focussed the view. For "taking" the picture is a pure science, as for ever proved by Messrs. Hurter & Driffield.

Taking Negative.

Having selected a good view, artists next have *to paint or etch, etc., them. The photographer does not make his picture*—A MACHINE DOES IT ALL FOR HIM. Whatever subtlety of tones, of drawing, there are in the photograph, these are the work of a machine. The operator has no part in it, and he cannot control the result at all, as the classical researches referred to have proved beyond a doubt. The fact that the photographer does not do the work is nearly always overlooked; he gets to talk of *his works* so much that he forgets that after all he has *only set the machine to work*, and he has no more done the work than the engineer who starts the locomotive pulls the train. This must be realised to justly estimate the credit attached to the producer. Now since the machine does the work, and since any intelligent person can easily learn to manipulate the machine, nearly all the credit of all so-called "artistic" photographs is in choice of view, arrangement on screen and choice of focus. In these matters the photographer is absurdly limited in power as compared with hand-work, by the mechanical conditions of the camera. It is therefore very easy to imitate an original worker in photography—a practice, I regret to say, far too common; mediocrity is ever imitative. In addition, the limited powers of the machine tend to level all workers, and prevent genius from fully expressing itself as it can in all individual arts. Very little credit really attaches to

any photographer, and such work can never reach any but a mediocre plane; it will never satisfy any genius, nor any first-rate intellect. But to proceed. We have now got the negative—*and by pure photography nothing more can be done.*

An *artist* now *might* improve the negative by retouching, local intensification and reduction, etc.; but it must be remembered that everything done by these methods *is not photography at all*, but hand-work, and only art when done by an accomplished and trained artist; and I know of no artist capable of doing such work who would waste time upon negatives. Such work must be judged, and the credit put down to art, not photography. This work is done to-day for commercial ends, and fulfils a commercial need, but all that has nothing to do with art or photography.

Next comes the "printing" from the negative. An *artist* has the power of choosing the process, and paper that will best suit his subject. *That is purely a matter of art-knowledge* if the object be artistic; but, if scientific, the paper will be chosen for scientific considerations. The choice here is very limited. After the paper is chosen, again comes the mechanical photographer and starts the engine, and *light does the printing*, he merely stopping the engine when the printing is done. In this respect the merest journeyman copper-plate printer is a greater artist than the photographer. If the photographer dodge in printing by masking, that is merely a crude form of art, and not photography.

Et voilà! He presents his print to the judges whom he imagined assembled. They discuss it, and the spokesman sums up as follows: "You selected the view: that was art (we allow you have an eye for the picturesque). You arranged it well; focussed it well (we think): that was art. But you were so limited by the machine that your individuality could but barely assert itself in this respect. Then you started a machine, and *that machine drew* the picture for you; you merely fixed its work by chemicals, which is photography, not art. You selected some ready-prepared paper, and the *sun printed your picture*, and you fixed it again. That is photography, with an iota of art in the selection of the paper. We

find you have not proved to us you are an artist, for *you* can execute nothing. You cannot even draw a cube fairly; and, moreover, we find your machine does not give us any idea of the magnificent scene you selected. One of us—an accomplished landscape painter—has been drawing the scene in black and white (we omit to refer to your colour impotency), and his *proportions* and tonality are altogether different from those of your photograph. His picture is altogether grander and bigger, yours being merely a *mechanical perspective drawing false in many respects.* We find that, if you think photography to be art, you must decide who is the artist in the case of an automatic machine—the penny, the person who drops the penny in the slot, or the automatic machine."

Perhaps, convinced by this inexorable logic, you would say: "Yes, I yield to reason, for only fools live in a fool's paradise; but would I not be an artist if I were to reproduce my negatives on copper, photo-etch them, and hand-print them myself?" They, knowing the process, would answer, "No! The laying of the ground is a mechanical process. The biting, if scientifically conducted—and all other ways are mere bungling—is mechanical; and finally but chiefly you are doing a set task, viz., to REPRODUCE your photograph. You are not like the etcher *creating a new work*, but merely mechanically reproducing the work of a machine. Any hand-work put on the plate will, of course, not be photography, though it *may* be art."

Finally the spokesman says to you: "You have demonstrated to us most clearly that photography *is not art*, and never can be. If, however, you like the results (we do not include the invaluable scientific results), do them; you can by them show in a VERY LIMITED way whether you have anything of the artistic temperament (we refer always to the unphotographic part of the work, as we have explained), but do not hold yourself up to ridicule by calling yourself an artist, unless you have been trained as an artist and follow art as a *profession*; for remember that many of us here could pay persons to do the merely photographic work, and soon take the wind out of your sails in selection of subject—for we are

professional artists. To be an artist you must have the power of SELECTION AND EXECUTION. No matter what the medium chosen, the lack of either is *fatal*, just as there are many real poetic natures who cannot write a stanza."

I may finish this little paper by a suggestion as to why I think artists invariably consider, and will continue to think, hand-work superior to machine-work. Photographs often interest them for a time, yet the interest is *never lasting*; people soon tire of them. I believe the reason of this to be that mankind will always value the personal element in a work; they constantly recur to the etching or painting because it has been done by a man.

Photography then, when not scientific or topographical, is a *pastime*, dangerous in many respects, as apt to foster morbid vanity in the degenerate, but useful often as leading its practitioners to think about art and to visit picture galleries, thus helping them to cultivate an æsthetic sense. But the snares of vanity are too strong to be resisted by the weak, and the cheap press hurries them to their doom. It has been well said that the chief use of the multiplication of cheap papers, and increased facilities given to every one to "have his say," has been the increased facility they offer for the *discovery of* fools—since in their columns alone fools are allowed to "have their say." Certain it is that photographic papers have helped photographers to discover many fools who would otherwise have lain *perdu*—amateur writers upon optical matters, upon art, upon science, and what not. We would suggest that the common fool in future hesitate before discovering himself.

Let photographers take the modest and legitimate ground that photography is not an art but a science, and further, that in one invaluable branch—topography—the *machine pictures* selected by an artist must always be superior to others, for a topographer may sacrifice detail for breadth, or accuracy for general topographical sentiment. Let there be no misunderstanding about the use of the word artist. An artist is a man thoroughly trained in the practice of an art (photography is a science), who devotes his life to his art to the exclusion of

everything else; his sole end and aim being the production of æsthetic works, whose object is to give emotional pleasure. Art is personal, and machine work can never be art. One must understand something of music to get the best work from a hand-organ, yet an organ-grinder with musical tastes is no artist. If any photographer aspires to become an artist he must cultivate some artistic method of expression, such as painting, sculpture, literature, acting, music, singing,—and practise it as his profession. Then, and not till then, will he be recognised as an artist; and then he may be aggrieved to find that the masters of his profession allow but few even of such trained practitioners the name of artist.

There is much good scientific work to be done by photographers, and if I am permitted to reopen the subject in another paper, I would suggest some systematic work to be undertaken by enthusiastic amateurs—work that would lead them to a far higher level than any taking of "pictures" during a short period of the year will ever do; and they will be relieved of keeping up the pretentious titles of artists, bickerings will cease, and photography be more universally respected and advanced.

There was excuse until quite recently for men who contended that photography was art. For men are justified in fighting for a cause, provided they base their fight on knowledge *up to date*; and until quite recently it was justifiable to contend that photography might be a fine art in the hands of an artist. That position, in the light of recent investigations, is untenable and foolish; but, like all old "truths," it will be for a time perpetuated as a superstition amongst the vain and uncultured. Photography is an easily acquired *science*, and never can be anything else.

Finally, there are some who may say—" But Carmine a second-rate painter, or Stylus a third-rate etcher, says—photography is art, and that is sufficient answer." It is no more an answer than when third-rate scientists or first-rate theologians deny the theory of Natural Selection. What one or two men say on this side or that matters not a rap; but the general consensus of opinion of a

body of first-rate specialists upon their own subject matters much; and the best artists are unanimous that photography is not art, and never can be, though till recently many able artists were doubtful. Art is personal; photographs are machine-made goods, useful, as is machine-made furniture, machine-made fabrics, and perhaps—for the slums—machine-made music.

P. H. Emerson.

THE KINSHIP OF THE ARTS.

IT may not, perhaps, be apparent at first sight that there are any very strong relationships, or points of affinity and resemblance, between the arts of literature, music, and painting, including in the latter term the other graphic arts allied to it; but a little consideration will, I think, offer very much indeed suggestive of points of contact and similarity. So much so, that the subject widens itself to a degree which becomes almost bewildering, and would tend to carry one into digressions which the limits of a short article make it impossible to follow and to do justice to in every case.

In the remarks and suggestions which I now propose to make I do not pretend to bring forward anything which can be of direct practical utility, but to those who find a pleasure in tracing the origins and analogous aspects of many things under the sun, I trust that the points of similarity which I shall endeavour to point out may not prove totally uninteresting and without value.

It is not my intention to venture into the depths of any profound philosophy which may account for the reasons why three of the arts to which I refer, namely, literature, music, and the graphic arts, should, or should not, be necessarily allied. It is to be taken for granted that they appeal to and stimulate the intellectual and sensuous sides of human nature. I wish merely to point out as simply as possible where and how the ideas, laws, and characteristics which belong to one or other of these divisions of the arts may be applied with equal force and in identical language to another. And if, notwithstanding my previous disavowal, my paper should have any practical value in a photographic journal, addressed to photographers, it will be that by laying stress upon qualifications which are essential to the highest conditions of

literary or musical art, and have their counterparts in the pictorial arts, they will bring home to us their lessons in that division which we call photography.

We shall perceive many striking analogies if we consider what constitutes the highest expression of art, both in literature and in painting, under which latter term I include the arts to which it is allied. It is obviously impossible that I should here be able to touch upon all of them; many of my readers will be able to expand the list for themselves. To begin with, the terms we employ are very often identical and interchangeable. We speak with regard to language as the expression of thought, and with regard to painting as the expression of ideas, in such terms as force, breadth, imagination, word-painting, poetic feeling, harmony of ideas, crudeness, vulgarity: we speak of idealism, of realism, of naturalism, of composition, freedom, improvisation, a laboured style, colour or colourless, simplicity, and many other characteristic terms which apply with equal force to one or other of the arts. The same influences have been at work to produce in literature the school which is called naturalistic as those which in painting have brought about the expression of the same feeling, and in both the methods and principles are identical. We find also in either case those who are termed idealists, realists, and impressionists, and the same fierce battle has raged concerning them on the one side as on the other. The impressionist claims to be governed by no laws other than those which he makes and unmakes for himself; he asserts that the highest art is to describe or to delineate what he sees and not what he knows, and he insists on his right to see according to his own conception of art. He will make use of the most obscure, the most contradictory, the most unintelligible of phrases; he will produce for you relations of colour which are astounding, and if they are not truth and reality as these have been hitherto understood, he will defend them as true to his own impression. If you do not agree with him *tant pis pour vous*. In fact, his position is unassailable.

The naturalistic writer is averse to be saddled with the epithet

of realist, and to be confounded in the same category; if, for instance, we may judge from the anger of Gustave Flaubert, the famous author of "Madame Bovary." Zola, the quintessence of naturalism, inclined at the same time towards realism. Naturalism, in literature at least, appears to be foreign to the genius of Englishmen; and we have amongst us perhaps but one follower of Zola, and he at an immeasurable distance below his master. The term is not unknown to photographers, though it may be doubted if a true naturalistic photographer ever existed. At any rate, in the same way as in literature, there are those to whom the appellation has been given who would indignantly disclaim it, and if the term is at all applicable to photographic work it is so in a sense distinctly different from that which holds good in literature and in painting.

The naturalistic writer claims to present to us the truth, the whole truth, and nothing but the truth. To the artist in black and white such a claim has on the face of it an aspect of impossibility; at least, as I have just remarked, it cannot be accepted in both cases from the same point of view. Realism, artistically considered, is the effort to give us an aspect of life and nature which is not photographically exact, which is not the brutal, bare and naked fact, but which induces us to think, to probe to the depths profound and hidden meanings, and to discover an impression of truth which is more complete, more striking than the reality itself.

In literature as in painting it is not good art to tell the whole story, to leave nothing to the imagination. Genius shows itself rather in suppressing minor incidents, in softening and toning down conflicting *minutiæ* of detail, and in throwing into relief by transitions of style, by masterly contrast, and by the instinct of selection those portions of the composition which are capable by their force and character of conveying the impression of truth to the finished work.

It is perhaps hardly necessary to note the qualification common to all the arts that no greatness can be achieved without much labour and patience, except to point the lesson to photographers

and to those who affect to see art in the productions of the (for other uses) admirable instrument known to us as the hand-camera. From this device no art ever did nor ever will proceed. Talent, as Buffon has told us, is but infinite patience. "Work, young man," said he. And again, says Sir Frederick Leighton, nothing has yet been done in this world without the bestowal of infinite pains. The power of genius alone has never yet accomplished work worth preserving.

Common to all the arts is the standard by which we estimate them. Those only are capable of estimating them who have served an apprenticeship, whose minds, whose eyes, or whose ears have attained a cultivated sense by study and varied acquaintanceship. Common sense, as it is called, is nowhere. *Vox populi*, in this connection, is not *vox Dei*. The measure of popularity of a work of art, be that art painting, music, poetry—what you will—is indeed almost a guide to its real value, for the latter is in inverse proportion. What great work of art was ever popular, or what popular work ever really great? See the crowd at a picture gallery, how they pass by with contempt a Francia, with derision a Holbein or a Dürer! See them crowd around those pictures which require not the slightest demand upon the intellect, no greater strain to understand than the domestic crudities of the holiday number coloured supplement! And the band plays tinkling tunes and popular melodies, and the many understand them, but they will not take the trouble to learn to appreciate a Wagner or a Whistler. And to come to photographic art, to what is the appreciation of the judges at our exhibitions extended, but to that which they and the public judge by "common sense"? The moral is, not that we can all be experts, work we ever so hard, but that in our appreciation of the kindred arts we must bow our own judgment to authority. We must not be ready to condemn because we do not understand. Perhaps there are no more striking instances of the contrary—of the insolence of private judgment—than in our photographic literature when it soars to criticism of art. We are acquainted with the youthful enthusiasts

who, with something of the crude knowledge and literary attainments of a sixth-form boy at a public school, burning with iconoclastic zeal to upset everything, dare to inflict upon us their pitiful depreciation of the great masters of painting! See too the critics at our own exhibitions, who, absolutely untrained as they are, deride simply because they do not understand, and will not think: who will have no guide but their common sense, which Heaven knows is common enough.

What has all this to do with my text? Simply this, that in literature as in painting, in music as in poetry, it is wiser to admit that there may be good in what we do not comprehend, and that a humble endeavour to fathom the depths will perhaps reveal to us that which lies hidden beneath. Shall we reasonably deride the genius of a Whistler, concerning whom those who are wise say that there is not a line, not a stroke, that he has ever made which is not admirable?

The treatment of my subject is necessarily somewhat discursive, and I have perhaps no better reason than the mention of the name of the great harmonic colourist to lead me to the consideration of the analogies between painting (and incidentally the other graphic arts) and music.

We are familiar with many expressions or terms which apply both to music and the pictorial arts. Some of these are universally recognised; others are more fanciful, due to the inventive genius of a master. We have, for instance, the expressions harmony, tone, key, theme, note, gamut, scale, pitch, arrangement, register, contrast, a highly-coloured style, word-painting, light and shade, brilliancy, touch, delicacy, execution, and many more whose application is equally appropriate to one art or the other. To Mr. Whistler is due the application of the more fanciful expressions by which he denotes his scheme of colour; and, indeed, treating subject as subordinate to arrangement, he appears scarcely ever to give any other title to his pictures. Thus we have such terms as a grey note, a note in opal, in pink, in red, etc.; a harmony in violet and amber, a nocturne in black and gold, in

grey and gold, in silver and opal, an arrangement in black, an orange note, a caprice in red, a scherzo in blue, a bravura in brown, an andante, and so on. These are suggestive enough, and it is instructive to note also that such terms as *scherzo*, *adagio*, *andante*, and the like are, musically considered, used in relation to measures of time, but at the same time are expressive of feeling. In Whistler's "Woman in White," the gamut of colour is expressed by a full-length figure of a woman in a white dress against a white curtain, which forms the entire background; in his portraits of his mother and of Carlyle, the scale in both is an arrangement of the combined harmonies of black and grey. How natural, after all, does it seem that his "Peacock Decoration" should suggest a harmony in blue and gold, the combination and harmony of colours first, the subject secondary. A nocturne, of course, suggests a night effect, and there may be several kinds, which we can distinguish by their relative qualities; for instance, an approach to total darkness, or the effects produced by moonlight, lamplight, and so on. It is not so much the principal lines of the subject which produce the effect as the gamut of colour or range of tones from light to dark. Often, in these arrangements, form is altogether sacrificed; there is no recognisable "air," so to speak, but one is reminded rather of the music of Wagner, in which there is no systematically designed harmony, no regularly recurring cadence of tune, but melody in the abstract, producing an indefinable musical effect. Whistler, as a distinguished French writer has said, has mastered the music of colour, to which he brings a rare nervous sensibility. As the fingers of the musician float lightly over the keys, so is his touch on the canvas, now light as air, now coming down on his keyboard with a strong and decided chord, and covering it with surprising modulations.

I need, I think, make no apologies for what may appear to be a digression inapplicable to photography. Is it altogether so? Is there anything, as yet but partially explored, in the method of photography which might induce hopes that it may

rise to such flights of poetic fancy? I cannot say. I will hazard no opinion. I am content to wait.

Before leaving the lessons to be derived from the work and teaching of this master let me quote, from the "Envoi" to one of his famous brown-paper catalogues, a few maxims in which more truth is enshrined than would appear from superficial consideration. They are these:—

A picture is finished when all trace of the means used to bring about the end has disappeared.

Industry in art is a necessity,—not a virtue, and any evidence of the same, in the production, is a blemish, not a quality: a proof, not of achievement, but of absolutely insufficient work, for work alone will efface the footsteps of work.

"There is one that laboureth and taketh pains, and maketh haste, and is so much the more behind."

The masterpiece should appear as the flower to the painter,—perfect in its bud as in its bloom,—with no reason to explain its presence,—no mission to fulfil,—a joy to the artist, a delusion to the philanthropist, a puzzle to the botanist, an accident of sentiment and alliteration to the literary man.

These are maxims of true art, and the analogy which I wish to make with photography is that to give to the latter the attributes of art these axioms must also be applicable. It is our duty so to apply them, and I believe our practice or system to be capable of receiving them. But photography, as it is as yet, too plainly betrays the method: industry, pains-taking and mechanical labour are taken as virtues; there is no delusion, the botany is accurate, there is no accident of sentiment; above all, is wanting the work which will efface the footsteps of work.

An instructive lesson may, I think, be learned if we inquire what analogies may be found between photography and that most personal of the arts which we call etching. And let us note that at its renaissance in modern times etching was decried

by those who called for grandeur of style, grandeur of art, as being too simple, too mechanical. They forgot the inspiration which is the soul of the art. Etchings are improvisations which can be multiplied and scattered broadcast. There is high art in improvisation expressed by speech, music, or painting—as high as that which has demanded great thought, time, and labour. Etching is essentially the work of the moment, of caprice, of inspiration. Photography exacts, according to those who practise it in its restricted sense, the false qualities of prettiness, accuracy, painstaking, absence of blemishes and technical faults, and all the little cleanlinesses and neatnesses which delight the Philistine mind.

Yet, though they are widely different from the point at which the inspiration of art begins for each, there is something analogous in the method of working which it is curious and instructive to follow out. Briefly, then, suppose on the one hand the etcher's copper impressed with the leading lines of his subject scratched through the protecting medium; on the other, the dry plate similarly impressed by the action of light. The lines of the engraved plate shine clearly and brilliantly on the blackened surface: it is a negative, in fact, and the etcher and photographer must both gain from practice the facility of judging their work in this reversed condition—of reading it as easily as a compositor does his imposed type. The object in the one case is to produce the relative weights of light and shade in nature by the action of acid upon the metal; in the other, by the chemical action of the developer. The etcher mixes his acid bath with care as to strength of proportions, the photographer does likewise with his developer. The metal plate is immersed and carefully watched, freed from air bubbles, allowed to remain subject to the action for an exact and calculated length of time; evident signs guide the worker as to the appropriate strength of the bath he is using. He removes the plate and carefully dries it, and stops out those portions where the desired action has taken place with a coating of transparent varnish. Again

the acid does its work, again for a stipulated time; yet again is the transparent varnish applied to stop the action, and in repeating these processes, perhaps, at last, a dose of strong, undiluted acid completes the work required of it. Meanwhile, the parts protected may at will be partially exposed by means of the needle in order to produce the most delicate lines. For the photographer I need not follow, step by step, the analogies which will arise. True, our means of affecting, during development, such and such portion at will is limited; but it is after the development of the negative is complete that the power of using similar means is ready to our hands in order to impart, if it be possible, the character of art to the finished picture. This is the work which tends to efface the footsteps of work, and is an effort in the direction of destroying or minimising the evidence of that which has been mechanically produced.

The stigma which we have to combat in our claims to recognition as art is mechanism, and the farther we can succeed in getting away from that enemy the more we shall advance. The very name of photography implies that any and every device which has for its object the lessening or increasing the action of light on a portion or the whole of our subject, and therefore producing contrast of tone, is legitimate, and consequently remains pure photography. But in advocating the practice to the fullest extent it is essential that it should be done with talent, that it should not be evident, and that we should preserve the forms of the original negative. We must introduce no new matter; in fact, our operations, generally speaking, are limited to graduations of light and shade, or to suppression and selection. It can hardly be supposed to be inferred that it would be legitimate to introduce a flower or other object treated with any species of absolute convention. On the other hand, in the case of landscapes, it is not illegitimate to alter the key or scale of tone of the original subject, such as this might have been when the camera was brought to bear upon it. A nocturne, for instance, cannot be offensive to the principles of the art. The highest argument, I

take it, for the practice I am advocating is that we bring art to bear, for I hold that in every possible way in which we can suppress the mechanical in photography, in so much do we approach to raising it to the dignity of art.*

The excellence of the instruments we use is nothing. A first-class lens has no more artistic value than a first-class pen.

I trust that I may be allowed here to take the opportunity of protesting against the arrogation of the name and attributes of photography to photography combined with the use of a lens. The purest photography is that in which no lens is used. The lens is but an adjunct, to which is undoubtedly due much of the hatred with which photography is artistically considered, and it can scarcely be doubted that had there been in the early days a possibility of making the plate more sensitive even than it is at present the baneful influence of the lens would not have been so readily requisitioned. We have been met by the objection that by discarding, or rather by not availing ourselves of, the lens we do away with the most distinctive feature of photography. Certainly that is so, with the qualification *lens* photography. But it would be as reasonable to assert that by not using a type-writer we do away with the most distinctive feature of the art of writing. There is still hope, however, that sensitive surfaces of much greater sensibility may be one of the improvements of the future, and at least I think that the fallacy that photographs taken without a lens are necessarily "fuzzy" has been successfully exploded.

* I should like to give an instance as an illustration of my argument, without, however, implying that it covers the whole ground of my contention. I allude to Mr. Ralph Robinson's beautiful picture "All illumined with a rustic glory." I understand that the halo effect is solely due to the action of light on the sensitive plate. To my mind, for some unexplainable reason, the result is not entirely successful or suggestive of truth, but I say that if by any method of working on the negative this beautiful effect, which is sometimes, but rarely, seen, can be more truthfully brought out, and at the same time the manner of effecting it is not evident, then it is not only legitimate photography, but it is an exercise of very high artistic power.

It has been well said by the great word-painter, Théophile Gautier, speaking of etching, that "*le texte est toujours préférable à la traduction.*" We cannot claim for photography the same spontaneity of genius, but in relation to it, if I had the temerity to add a word to the expression of so eminent an authority, I would say that, in default of the text, a free translation is preferable to a slavishly accurate one.

ALFRED MASKELL.

NOTES.

THE last three months have been singularly devoid of any matters interesting to photographers; the journals contain nothing very new or striking.

At a recent meeting of the members of the Society of Arts, Professor Silvanus P. Thompson delivered a lecture upon "The Measurement of Lenses." The text of the lecture is published in the *Journal of the Society of Arts*, and as it is extensively illustrated by diagrams, much may be learnt from close study and perusal. As a proof of the exhaustive nature of the lecture we may mention that it is divided under no less than eighteen heads, viz.:—

> 1. Diameter, or linear aperture—2. Thickness or length from pole to pole—3. Focal power, or its reciprocal, the focal length—4. Position of principal focal planes—5. Position of optical centres—6. Angular aperture—7. Chromatic aberration—8. Spherical aberrations, lateral and longitudinal—9. Chromatic difference of the spherical aberration—10. Loss of light by reflection from surfaces—11. Absorption of light in transmission—12. Illumination of field, central and marginal—13. Complaneity of focus—14. Degree of distortion of image—15. Degree of astigmatism—16. Accuracy of centring—17. Definition in margin of field.—18. Refractive indices of material.

The lecture is really a most complete treatise, and when published in separate form will doubtless be referred to as a standard authority.

Considerable attention has been recently paid to the recent explosions in connection with lantern exhibitions. A very serious and fatal accident occurred at Ilkeston, and, although an inquiry has been held, the cause of the explosion does not appear to have been satisfactorily established; it has been tacitly accepted that the gases were mixed, the oxygen bag having been charged with hydrogen and *vice versâ*. Another explosion, which might have had serious results, occurred at the Photographic Club. In this case the pressure gauge (Bourbon's) burst during the turning of the valve of the oxygen cylinder. Mr. Bridge, the operator on the occasion, has, in conjunction with other men, held an inquiry, and they have concluded that there was oil in the valve. It appears to us that sufficient attention is not paid to the materials that are used in the manufacture of these pressure gauges and other lantern fittings. We quite recently had a regulator in our hands, in which the diaphragms were made of india-rubber. This regulator had not been in work many

months, and the india-rubber was perished, the regulator being, as a consequence, quite useless.

The lantern has become so popular, and is so generally used all over the kingdom, that the question of safety of accessories demands the attention of the Government. All cylinders, gauges, and regulators should be tested and stamped. In these days of competition everything is regulated by price, and those who have taken the trouble to examine some of the lantern accessories that are in the market will wonder, as we do, that accidents are not more frequent. Any one who could design a cheap and useful gauge that would show the pressure and measure the gases as they are used, would make a fortune. At the present time more gas is wasted than used: most of the workers with the lantern are entirely in the dark as to the quantity of gas used; they are also quite at the mercy of suppliers as to the quantity that the cylinders contain when sent to them. Surely it should be possible after reducing the pressure to measure the gas correctly as it is used.

The constant accidents, none of which are ever satisfactorily explained, cause alarm and tend to make nervous people absent themselves from any exhibition in which the optical lantern is used.

We notice that photography is well represented on the Council of the Royal Society. The last elected representative of the science is Captain Abney. The other members more or less interested in photography are, Professors G. D. Liveing, Norman Lockyer, Crum Brown, and Dr. Hopkinson. Perhaps no modern science has more prominent exponents than photography; and yet, except very occasionally, their researches are not put before the public in a popular form, and they are known only to be working for the advancement of photography by a very small circle. We believe that the public are now sufficiently educated in photographic matters to be able to understand and appreciate the experiments and researches in photographic science.

During the last few months a new gelatino-chloride printing-out paper has been introduced by the Britannia Works Company, which appears on all hands to have special advantages, not the least being that it is cheap and coated with much care. It is possible with it to get a considerable range of tone and, of course, a matt surface. This is the second English manufactured gelatino-chloride printing-out paper; the other, "Celerotype," has thoroughly been established as a competitor with the well-known Obernetter and Aristotype papers. These gelatino-chloride papers give great wealth of detail, a good print from a poor negative, and, as a consequence, are in much favour with amateurs, especially beginners.

A successful exhibition has been held at Leeds, under the auspices of the Fine Art Gallery Committee of the Leeds Corporation, aided by the Council of the Leeds Photographic Society. A very large number of photographs have been gathered together in the splendid galleries, and during the time the exhibition has been opened lectures, illustrated by the optical lantern, have been given by many well-known men.

The 1891 Exhibition of the Photographic Society of Great Britain, was, we understand, well attended. Unfortunately, there is considerable internal dissension and disagreement: several prominent members have resigned, including

one of the Vice-Presidents, and two members of the Council. The society certainly has never taken its position at the head of photographic matters; and now that the Camera Club has been so firmly established and is such a power all over the world, it does not seem likely that the "parent society" will ever have the influence that might be expected of such a society. We are pleased to note that several lectures will be given during the next few months; so far the following have been announced:—T. Bolas, F.I.C., F.C.S., "Relations of Photography to the Industrial Arts;" Chapman Jones, F.I.C., F.C.S., "Distortion of Outline by Photography;" Professor R. Meldola, F.R.S., "Photography as a Branch of Technology." This is a good beginning, but when it is remembered that the society's quarters are at the top of a very high house, and that there there is such a "getting-up stairs," it is very doubtful whether the lecturers will be encouraged by large audiences. At the last ordinary meeting, Mr. Andrew Pringle read a very excellent paper upon "Photo-Micrography," a subject in which every one knows he is *facile princeps*. It is somewhat strange that, just as the Camera Club has ceased to affiliate provincial photographic societies, the P.S.G.B. should canvas the question; and after much discussion some sixteen societies (out of over two hundred) have been admitted and affiliated to the "parent society" with certain privileges and advantages.

It is gratifying to notice that the Fund being raised to present Dr. Maddox, F.R.S., with a testimonial, has already reached the substantial sum of £200. There is no doubt but that workers in photography owe Dr. Maddox a great debt of gratitude for his researches in photography, which he with such liberality gave to the world.

In quite a recent number of *Photography*, Captain Abney, writing upon "Light in Photography—Fluorescence," says:—

> "Recently, the writer had a practical exemplification of the value of fluorescence in increasing the photographic value of a white surface. Certain plans had to be copied. They were all drawn apparently on the same drawing paper. There seemed no distinction between them as to whiteness, and yet out of the four only one gave a dense negative with a certain exposure to uniform light, whilst the other three were decidedly weak. Negative after negative gave the same anomalous results. When one of the plans which gave the weak negative was photographed with that which gave the dense negative on the same plate, and the images, of course, developed together, an identical difference in density was discernible. Putting the paper in the spectrum, the reason was apparent. The paper which gave the densest negative was strongly fluorescent, and, perhaps, slightly phosphorescent in the ultra-violet, whilst the other was not. The fluorescence was probably due to some form of lime in the one which was absent in the others. It is rather remarkable that there are very few papers which do not, in some degree, show this violet fluorescence, and this is especially the case in that which forms the white surface of cardboard. The phosphorescence is often to be seen by taking the card into a perfectly dark room where the surface may just be visible. But fluor-

escence is not confined to the violet form. Eosin, for instance, exhibits a fluorescence in the green, and, following Stokes' law, it is found that the mean wave length of the colour emitted is greater than that which causes it. In photographing costumes, also, fluorescence plays a very important *rôle*. In the present day, the dyes used in ribbons and materials for ladies' dresses are very often coal-tar dyes, and a very large quantity of these exhibit fluorescence in a very marked degree. There is, for instance, a yellow dyed ribbon which appears excessively luminous, more so, indeed, than any other saturated hue of yellow with which the writer is acquainted. This would naturally be expected to come out dusky on an ordinary plate when photographed, on account of the preponderance of yellow; but, although yellow, it might naturally be supposed it was made up of a mixture of red, yellow, and green rays, while a mixture of the first and last make yellow. Now green is *not* a "non-actinic" colour to bromide plates, and hence the green that might be supposed to exist in it ought to prevent the ribbon from photographing as a black object. A photograph, however, shows it to be almost as photographically as black as black velvet."

We are pleased to notice that the Teachers' Guild of Great Britain and Ireland are proposing to collect lantern slides for the use of members. It is intended that these shall be of a distinctly educational character; and there are doubtless many of the readers of the QUARTERLY who can aid the movement by sending spare slides to the Office of the Guild, 74, Gower Street, W.C.

The Optician, a very successful weekly paper, the organ of optical, mathematical, philosophical, photographic and other scientific instrument industries, has reached the fortieth number. It contains much valuable information, and has already done good for the special trades which it represents.

From America we hear of another wonderful invention or discovery. Mr. N. S. Amstutz has brought out a process by means of which he claims to be able to transmit photographs and pictures any distance by telegraph. The action of the instrument is briefly described as follows:—

"The instrument, which is to be known as the artograph, and has some points in common with the telephone. In this new invention, however, it is the play of light, and not of sound vibrations, that is employed as the agent. The picture to be telegraphed is photographed upon a film of gelatine and bichromate of potassium, which composition is extremely sensitive to the action of light, hardening where most exposed to its influence and softening in the shaded parts. The surface so prepared is next washed with lukewarm water, which dissolves away the portions of it which have been in shadow, leaving the strongly lighted parts in relief, the half-tones being also expressed. This part of the process is not new, being in use for the production of electros for newspaper illustrations. The gelatine film is now mounted upon a sheet of celluloid and placed upon an accurately turned cylinder which is made to revolve. Close in front of the cylinder is a bar with a carriage holding a stylus, which traces a line upon the gelatine sur-

face, the point rising and falling according to the inequalities of the surface, and a mechanical movement causes the stylus to gradually trace close parallel lines upon the film. The stylus or graver is connected with an electric current, the vertical movement, by ingenious mechanism, regulating the strength of the current passing to the distant station. The receiving machine has also a cylinder carrying a smooth gelatine film, a graver arm moving over it as in the transmitter. The graver is actuated by an electro-magnet, the strength of which varies with the varying current received. When, for example, the sending instrument is passing over a valley of the prepared film, the maximum current passes, depressing the graver at the distant station, which cuts out a similar low place in the receiving film, which gradually becomes an exact copy of the original. When all is complete this film is removed from the cylinder and rolled out flat ready to form an electrotype for printing. The time occupied for an ordinary column-wide illustration is about ten minutes, and the stereotype can be produced in a few minutes. From the original film copies of any required size and delicacy, according to the purpose for which it is required, may be produced simultaneously at a number of news centres, so that an illustration and the telegraphic account may appear together. The first pictures by this process were transmitted twenty miles by a single wire whose voltage was 110."

In connection with the recent Pall Mall Photographic Exhibition, twelve selected photographs were reproduced by the Woodbury gravure process, and published under the title "Photographs of the Year." The letterpress, a criticism upon the exhibition, was supplied by Mr. H. P. Robinson, and the selection and arrangement by Mr. Charles W. Hastings. The book, which was published by Messrs. Hazell, Watson, & Viney, Ld., was practically all bought by subscription. It was got up with considerable taste, and marked an epoch in the reproduction of photographs in this country.

Under the title *Amateur Kunst*, Herr R. Paulussen (Vienna) has issued photogravure plates, on which are thirty-seven reproductions of photographs recently exhibited at the Vienna Photographic Exhibition. The work is most admirable, and for an exhaustive notice and review we would refer our readers to the *Amateur Photographer* of the 1st of January.

Mr. T. R. Dallmeyer recently introduced to the notice of the members of the Camera Club, in a short paper, his "New Tele-Photographic Lens." The object of the lens is to make it possible to produce large images of distant objects, without cumbersome or extensive apparatus, and with only a small extension of the camera bellows.

So many readers of the QUARTERLY are interested in the work of Mr. H. P. Robinson, who has done so much to advance picture making by photography, that they will hear with great pleasure that Mr. Charles W. Hastings has in preparation a lecture on "The Life and Work of Mr. H. P. Robinson," which will be illustrated, by means of the optical lantern, with some sixty or seventy of Mr. Robinson's choicest pictures. The lecture will be in a great measure

educational; it will, however, include recollections of Mr. Robinson's long connection with photography in this country.

In a recent number of the *British Journal of Photography*, the editor writes:—

> "Why do portrait lenses deteriorate by use? was the query put to us when calling on a professional portraitist a few days ago. Our friend told us he had a cabinet and *carte* lens by a leading optician that used to give good pictures with the full aperture; now neither would unless it was considerably stopped down. On focussing the lenses on the ground glass, the definition was perfect with each. On examining the camera, however, the cause of the trouble was at once seen. This apparatus, of excellent workmanship, was of the old-fashioned type, made in the wet-collodion days, and the dark slides were fitted with carriers having silver wire corners. By constant abrasion by the sharp edges of the plates the wire had become much worn away, and then, by its thinness, bent. Careful measurement showed that the sensitive plate was sufficiently out of register with the focussing screen to throw any well-corrected lens, when worked with its full aperture, quite out of focus, though not sufficient to do so when tolerably well stopped down. This is not the first time that we have known lenses to be suspected of deterioration, when the camera has been unsuspectingly at fault, even by experienced workers."

The report of the International Congress of Photographers, held at Brussels in August last, has now been issued. It is published by Gauthier Villars, of Paris.

Since the publication of the last number of the QUARTERLY, a new developer "Rodinal" has been introduced. It gives a good bluish black colour and full detail and gradation; in addition, it will recommend itself to many by reason of its non-staining properties.

"DUNSTER MILL."

John A. Hodges.

THE

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NATURE'S LIGHT-SCALES AS RENDERED BY PHOTOGRAPHY.

II.

BEFORE proceeding to the most interesting phase of this question, it will be first necessary to just glance at an important problem in photographic processes, which perhaps affords a field for many interesting experiments. Suppose that there are a series of luminous squares like those in Fig. 8, where square No. 1 is of a certain unit degree of brightness, square No. 2 is twice as bright as No. 1, and so on, each square being exactly twice as bright, photometrically, as its left-hand neighbour, the figures in each square thus representing their respective photometric intensities, while the factor between any two contiguous grades is 2 throughout. What happens if this series is photographed? I am not aware whether any deliberate experiments have been made specially to determine what are the extreme contrasts which can be normally registered, with careful management, upon good gelatino-bromide or other sensitive plates. It may be doubtful whether, when sufficient exposure has been given for just registering square No. 1, the square 256 will not have suffered reversal to some extent, even under the most careful management. But, for the purposes of the argument, it will be legitimate to suppose that an ordinary well-made plate, or other sensitive film, will record a faithful

image (and the supposition cannot be far from the truth) of the whole of this series of squares, although the resulting image in the negative may or may not present contrasts too great for printing purposes. Fig. 8A may represent the negative rendering of Fig. 8. The brightest square in Fig. 8, No. 256, becomes the darkest square in the negative, or No. 1 in Fig. 8A, while the darkest square in the original (No. 1 in Fig. 8), becomes the brightest square, No. 25·6, in the negative, Fig. 8A. But it by no means follows that the extreme contrasts in the negatives will be the same, photometrically, as those in the original, for it is notorious that different exposures, and perhaps development, give renderings of exactly the same subject varying greatly between themselves as regards the amount of contrast. As an example, then, the extreme contrasts in the negative rendering are re-

1	2	4	8	16	32	64	128	256	Factor = 2

Fig. 8

25·6	17	11·4	7·6	5	3·4	2·25	1·5	1	Factor = 1·5

Fig. 8a

presented as 1 to 25·6 instead of 1 to 256, the light-scale being thus compressed into one-tenth. But then the question arises: will the grades or ratios between any two contiguous squares *in the negative be equal throughout the series*, as was the case in the original, or not? If they are equal, then—with the extreme ratio of 1 to 25·6—the ratio of brightness between any two consecutive squares will have to be 1·5, each square being exactly 50 per cent. brighter than its neighbour on the right. That the ratio of brightness between adjacent squares must be equal, or nearly so, throughout the series, in the negative rendering as in the original, may be proved indirectly. For, while preserving the extreme ratio of 1 to 25·6, or whatever it is, it will be seen that it is impossible that the light-ratio between adjacent squares towards the left-hand of Fig. 8A can be greater than 1·5 without it following, as a matter of necessity, that the light

ratio between adjacent squares towards the right-hand end of the series must be reduced to something less than 1·5, the result being that the denser and duller squares on the right (representing high-lights) would be rendered flat, or wanting in contrast or differentiation; while the brighter squares on the left (representing shadows) would be rendered with undue emphasis as regards their contrasts. It would then follow that the eye, with its great sensitiveness in comparing degrees of moderate contrasts together, would perceive the incongruity, and in properly exposed negatives shadows would invariably be rendered hard and high lights flat, or *vice versâ*. But even if the equality of light grades in the original, Fig. 8, were violated in the negative rendering, Fig. 8A, it will be easily seen that when a positive impression is again taken from the negative, Fig. 8A, this inequality of the light ratios between adjacent squares will largely, if not wholly, be neutralised again, provided the film of the positive is of the same nature as the negative film.*

Therefore we are quite justified in assuming that a graduated series of *equal* photometric ratios between a set of squares (or patches of light of any shape and size whatsoever) will be translated in a positive, if not in a negative, as another series of luminous squares, etc., also having *equal* photometric ratios between consecutive grades, although the *extreme* contrasts in the positive

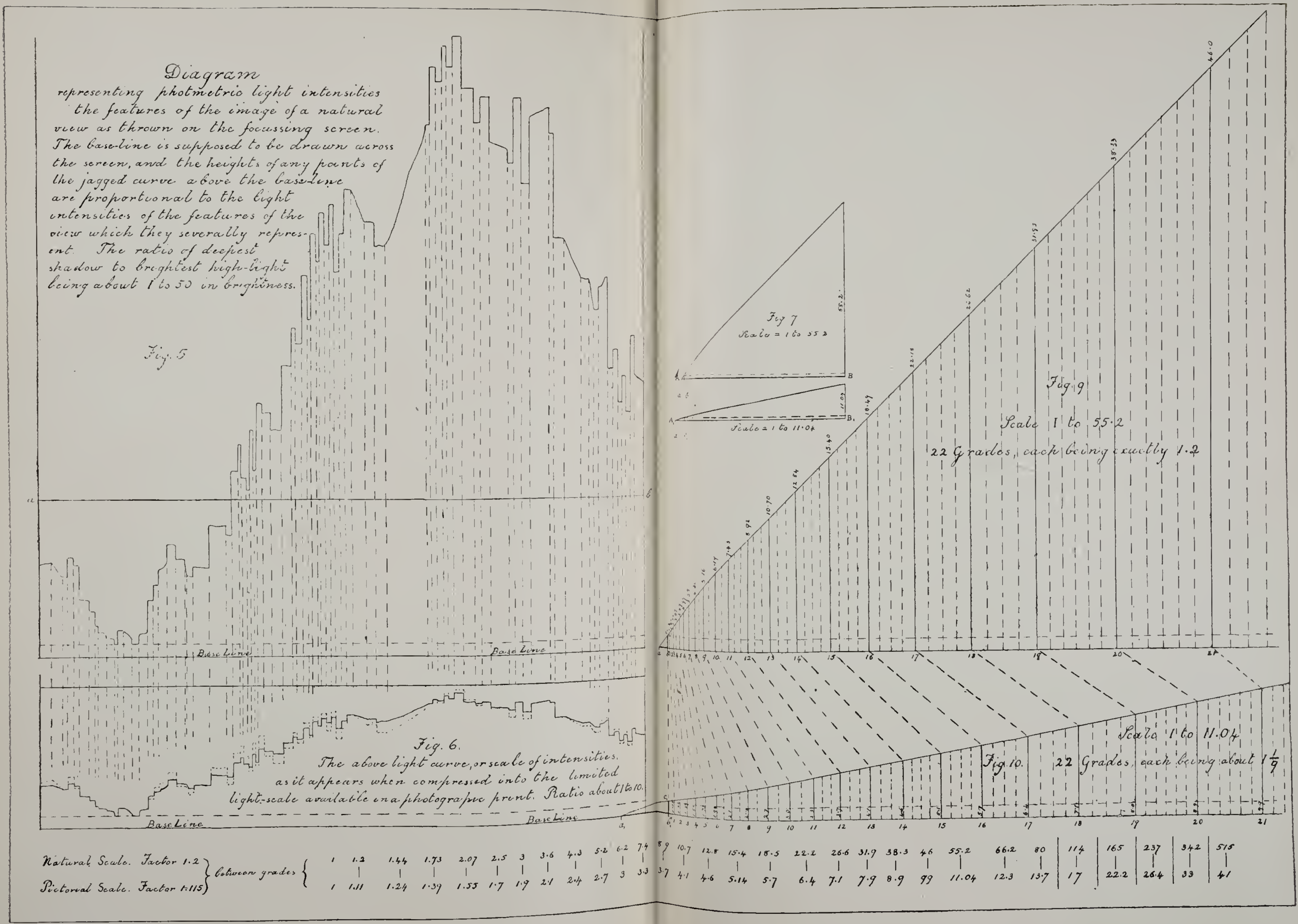
* I am glad to find, since writing these lines, that the valuable experiments of Messrs. Hurter & Driffield amply confirm the conclusion which is indicated by the above *à priori* line of reasoning. Their investigations clearly show that a series of lights, whose intensities are in regular geometrical progression like Fig. 8, will be registered in the negative, also in regular geometrical progression, like Fig. 8A, provided the exposure falls between certain limits. But they do not seem to have definitely settled what is the *extreme* amount of contrast within which a well-coated plate will correctly register. In *Photography*, for February 19th, 1891, Dr. Hurter gives a diagram illustrating in a graphic manner the nature of the photographic action on a bromide plate in relation to photometric light intensities. The law indicated is that, within certain limits of contrast (not definitely stated) and of exposure, a series of lights in regular geometric progression are registered in the negative by absolute amounts or densities of silver deposit which run in *arithmetical* progression, while the amounts of light transmitted thereby (or their opacities)

rendering may be very different to that existing in the original.

Let it now be supposed that the camera is set up and focussed upon some desirable landscape view, which presents some considerable contrasts between the highest lights and deepest shadows. Of course it is well known that the image projected upon the focussing screen, although differing widely as regards absolute brightness from the real scene, nevertheless accurately represents all the contrasts or photometric light-ratios as they exist in the actual view; and if the extreme contrast existing in the real scene is 1 to 100, then the extreme contrast found in the image on the ground glass will also be 1 to 100, provided that no appreciable stray-light is allowed to fall on the screen, which would inevitably raise the brightness of the shadows in a much greater proportion than that of the high-lights, and disturb the ratios. Many a photographer has learned from bitter experience that stray light in his camera is apt to play the mischief, especially with the shadows of the negative.

Now let an imaginary straight line be drawn (horizontally for instance) across the focussed image on the ground glass—the *base line* shown in Fig. 5 (*see* diagram-sheet). This line will cut across various features and details of the view as they are thrown upon the screen. Let the vertical distance between the base line in

run in regular *geometrical* progression like the original, although the extreme contrasts may be very different to the original, according to the stage to which development is carried. For the extreme contrasts go on increasing as development progresses (up to a certain limit), at the same time that the ratios between the *amounts* of silver-deposit keep constant or approximately so throughout the stages of development. This apparent paradox cannot be very clearly explained in a few lines; but it depends on the fact that the densities or absolute amounts of silver deposit run in an arithmetical series, which is not logarithmic to their relative light transmitting powers, but logarithmic to a *variable base*. If, at an early stage of development, the amount of silver deposit in the darkest shadow of the negative is just sufficient to transmit two-thirds of any light passed through it, then that fraction is, at that moment, the base of the unvarying logarithmic series of densities or absolute amounts of silver deposit, and this base-fraction obviously goes on decreasing in value as the development progresses.



To face page 176.

Fig. 5 and the dotted line just above it represent the photometric brightness of the darkest part of the image cut through, and then erect vertical lines whose heights shall be in exact proportion to the photometric intensities of the features of the image traversed by the base line, drawing each perpendicular immediately over the place where the base line cuts the feature or detail, whose brightness the perpendicular is supposed to represent by its height. Then, on joining the tops of these vertical lines, we obtain the jagged light-intensity curve shown in Fig. 5, which serves to show, in a graphic manner, the degrees of contrasts existing in the details of the view along a certain line drawn across the picture. The extreme contrast between the deepest shadow of the view and the highest light (represented by the highest pinnacle) is supposed to be about 1 to 50, a very common amount of natural light-scale.

And now, what must happen when the landscape view in question has to be rendered in positive on paper in which we cannot command a greater extreme contrast, suitable to the nature of the subject, than 1 to 10, for example? The horizontal line *a-b* in Fig. 5 is introduced to show the limits into which, under the above supposition, the light-scale of 1 to 50 will have to be compressed in the print. The height from the base line up to *a-b* is ten times the unit height between the base line and the dotted line just above it, and a graphic curve, representing the contrasts along the same base line in the positive print, must not rise anywhere above the line *a-b*.

Now the manner in which the compressed light curve is obtained is, in outline, as follows, and results naturally from the postulates which have been established above. Neglecting needless accuracy, a triangle is taken, preferably of the shape shown in Fig. 7 and of the size shown in Fig. 9, where the height is a little more than the height of Fig. 5. The base line of the triangle Fig. 9 is placed in line with the base line of Fig. 5, and a vertical line, *b-c*, is cut off by alignment from the dotted line in Fig. 5. Therefore, the vertical line *c-b* becomes the unit perpendicular, and *a-b* the

unit base line. A convenient factor, such as 1·2 or $1\frac{1}{5}$th, is taken as representing the light ratio between imaginary light grades as existing in the view; and this factor must, if multiplied by itself repeatedly, make up an extreme ratio something near 1 to 50. This is found to be 1 to 55·2. At the bottom of the diagram sheet the top row of figures represents the results of multiplying 1·2 by itself until 55·2 (and beyond) is obtained, between which and 1 there are thus 22 equal grades. Along the base line of the triangle, Fig. 9, distances are set off (measuring always from *a*) in exact proportion to the geometrical series of numbers obtained by multiplying 1·2 into itself, and vertical lines are erected at those points. Thus the fifteenth grade of light intensity is 15·4, and to obtain a vertical line in the triangle, Fig. 9, to properly represent by its height this degree of light intensity, we must measure off a distance along the base from *a* to 15, which is 15·4 times the unit base line *a-b*. Then the perpendicular at 15 represents the fifteenth grade of light intensity. The twentieth grade of light intensity, obtained by multiplying 1·2 by itself 20 times, is 38·33, and the perpendicular to represent it is erected at the point 20, which is obtained by measuring off, from the apex *a*, a line *a* to 20, which is 38·33 times the length of the unit line *a-b*. After all these principal grades have been represented by a series of perpendiculars, intermediate grades may be introduced between them (as shown by the dotted lines) for convenience.

Now, we want to graphically reduce our extreme light-scale of 1 to 55·2 to one-fifth of that amount (purely as a typical example), or as 1 to 11·04, still keeping the same number of 22 grades between the extremes. Having found what must be the *factor** between grades for the reduced scale, it will be found that the new ratio between grades will be almost exactly 1·115, or about $1\frac{1}{9}$ instead of 1·2. On multiplying 1·115 by itself 22 times the extreme of 11·04 is obtained.

* The factor is obtained from the following formula, where F represents the required factor: $\log. F = \frac{\log. 11{\cdot}04}{22}$.

Turning now to Fig. 10, a base line is drawn and a perpendicular, *b-c*, is erected exactly equal to *b-c* in Fig. 9, and immediately below or in the same straight line with *b-c*. This then forms the unit perpendicular in our second triangle. At the right-hand end of the base, and immediately below and in line with the perpendicular 55·2 of Fig. 9 (not shown in the diagram for want of space), is erected a perpendicular equal in height to 11·04 times the unit perpendicular *b-c*. Then the top of perpendicular 11·04 is joined by a straight line to the top of the unit perpendicular *b-c*, and the line is produced until it cuts the base line at *a*. The distance *a-b* then becomes the unit base line from which the horizontal distances (from *a*) of the vertical lines which represent the light grades may be set off, as in the case of triangle Fig. 9. The figures along the base of each triangle indicate corresponding light grades in numerical order, while the figures affixed to each perpendicular represent the numerical photometric values of each light-grade compared to the unit-light intensity, which was selected to be the intensity of the darkest point of the scene cut through by the base line in Fig. 5. We are now in a position to plot out the graphic-light curve, Fig. 6, which represents the scale of reduced contrasts presented by all those features and details cut through by the base line of Fig. 5, which is again supposed to be drawn across exactly the same points of the positive contact print of the view, in which print the light-scale of 1 to 50 existing in the view has to be compressed into the supposed available limits of about 1 to 10. To give one or two instances of the method: the height of the highest pinnacle above the base line in Fig. 5 is measured off with the compasses, and its height is found to coincide with the grade $21\frac{1}{3}$ in Fig. 9. The height of the corresponding grade, $21\frac{1}{3}$, is then found in the compressed triangle Fig. 10, and this distance is the perpendicular height representing the highest light in Fig. 6, and, of course, must be set off immediately below the corresponding highest light in Fig. 5. Measuring off the height of each point of the jagged curve in Fig. 5, and finding what grade or intermediate fraction of

a grade it answers to in Fig. 9; then the height of the corresponding point of the jagged curve in Fig. 6 is always equal to the height of the grade in Fig. 10, which corresponds to the grade measured off in Fig. 9. In this way the whole curve, shown in the *unbroken* line in Fig. 6, has been plotted out.

I have described the essential points of the theory and practical methods, rendering it possible to accurately translate the light intensity curve of Fig. 5 into the more compressed light intensity curve of Fig. 6, at some length and at the risk of tediousness, because it is scarcely fair to expect scientific readers to take the soundness of the methods for granted, without any opportunity for criticism being afforded. I think it will be conceded that the methods are essentially accurate in their application to the photography of all subjects in which the range of light and shade is not too extensive to be simultaneously reproduced in the same negative, and to permit the highest lights to just impress themselves in the print when the shadows are printed to sufficient depth.

Now, let it be supposed that the jagged curve in Fig. 5, by its height at each point above the base line, represents the degrees of photometric difference, or contrast, existing between those major details or features of the view in question, which are *essential* to the making of the picture. At the left hand of Fig. 5 are represented the contrasts subsisting between certain essential features in the *shadows* of the view, all of which, in the real scene, stand out boldly to the eye. Let Fig. 5 be carefully compared with Fig. 6, and the difference is evident at once, and suggests in a graphic way the reason why so many subjects presenting strong natural contrasts are so poorly rendered by photography; instead of the more important details of the view being rendered in a clear and vigorous manner, as they appeared in the original scene, they are rendered in a flat and disappointing way, although the *extreme* contrasts in the photographic print will not strike the observer as being essentially different to what existed in the original. For it was proved in my last article that the eye's appreciation of rather

high contrasts, and great variations in them, is clumsy and indiscriminating; extreme contrasts of 1 to 10 or, better still, 1 to 20 in a photographic print yielding to the eye much the same sort of impression as extreme contrasts of 1 to 50 or more in nature would yield, especially when the print is not directly compared to the original scene. But it was also shown that although to the eye one high contrast is much the same thing as another high contrast, nevertheless the eye is extremely sensitive relatively to variations in those *moderate* contrasts which exist between contiguous features and details of natural views and which give them their distinctness and relief.

Hence it follows, that while such extreme contrasts as 1 to 15 or 20 which are available in a photographic print will do very good service for giving an idea of very much higher contrasts existing in nature, still those moderate and delicate contrasts existing between the essential details of the natural view cannot be lowered in value (by that compression of the light-scale which is necessary and unavoidable in the print), without the eye being at once struck by the divergence from reality, and being disappointed by a flatness and want of vigour which does not do justice to the original.

On comparing Fig. 6 with Fig. 5 the lowering of the contrasts between contiguous perpendiculars (representing details) is strikingly evident; the curve is much flatter throughout than in Fig. 5. By inspecting the figures given at the foot of the diagram-sheet it will be seen that a contrast of 1 to 2·5, in the original light-scale, is rendered as a contrast of 1 to 1·7 in the compressed light-scale of the print, while a contrast of 1 to 10·7 is rendered as a contrast of only 1 to 4·1 in the compressed scale of the print, and so on; corresponding degrees of contrasts in the two scales being shown in figures one below the other. But the eye is very sensitive to alterations in those minor contrasts which are *contiguous* in the picture.

As a still more telling illustration or proof of the above statement, let a long series of small rectangular spaces be imagined in

immediate contact, each being exactly $1\frac{1}{50}$th (or 2 per cent.) brighter than its neighbour on the left. If there are 325 of these strips, the photometric contrast between the darkest, on the extreme left, and the brightest, on the extreme right, will be as 1 to 100. Now, a difference of 2 per cent. in brightness between two strips in immediate contact is easily perceptible to ordinary eyes, therefore all the strips would be clearly distinguishable from one another, and would constitute the *details* of the series. Now, let a photograph of the series be produced in such a manner that the contrast between the two extreme strips is reduced from 1 to 100 down to 1 to 5 (a trifle over). The light scale is thus very strongly compressed, and it then follows that the contrast between any two contiguous strips will now be as 1 to $1\frac{1}{200}$, or a difference of $\frac{1}{2}$ per cent., instead of 2 per cent. as before. Now, it has been proved, by careful experiments with the experimental top, that such a small contrast as this is absolutely imperceptible to ordinary eyes. Therefore it follows that the rectangular strips will *no longer be discernible*, and that the whole effect would be that of a gradual and unbroken shading from one extreme of the series to the other. In other words, the *details* of the original have been altogether obliterated by the compression of the light scale, although a passable degree of contrast between the extremes is still preserved.

The pith of the whole matter may be summed up thus :—

While photography enables one to compress a very extensive natural light scale into the much narrower limits at the command of the printer, still it performs the operation in a strictly mechanical and accurate way, by modifying all contrasts, great and small, according to photometric laws ; whereas human vision does *not* estimate or appreciate natural and artificial contrasts in a manner directly related to their photometric values, but is far more sensitive to modifications in the smaller contrasts than it is to modifications in the greater contrasts.

Hence, then, for very many subjects, simple photography by printing is not, and never can be, a faithful interpreter to the

eye; its translations of such scenes are vitiated by the fact that the eye appreciates contrasts in quite a different fashion from photography.

Now it will scarcely need pointing out that a faithful painter, or other hand-artist, is restricted in his work by no necessary photometric laws such as are embodied in photography, but is perfectly free to treat his subject in that manner which best corresponds to the eye's peculiar methods of estimating contrasts, and which therefore yields to the sight an impression which is faithful in proportion to the cunning with which the idiosyncrasies of vision are humoured.

In my last article I discussed the case of an Alpine view, presenting the great contrast between the brilliantly illuminated snowy peaks and clouds in the far distance, and the ruined shepherd's hut, overshadowed by dark pine trees, which we supposed to form such a necessary part of the nearer foreground. In the actual view it cannot be said that the features of the shanty stand out with undue boldness; indeed, the photometric contrasts, whose distribution and amounts are chiefly responsible for its visibility and form, *cannot* be lowered—as they inevitably *must* be in the best possible photograph—without mischief to the picture resulting in the shape of flatness in the depicting of its principal objects and details.

But the painter or etcher is perfectly free to depict the ruined shanty with just that boldness, or amount of contrast, which will give it the appearance of standing out in the picture with as much relief and vigour as is desirable, without making it unduly distracting; and this he can do in spite of the fact that he, like the photographer, is obliged to compress the *extreme* contrasts existing in the actual view into the much narrower extremes of contrast which he can command on his canvas—about 1 to 40 at the most.

We saw that the jagged curve shown in unbroken line in Fig. 6 is a graphic illustration of the contrasts existing along a certain line drawn across the photographic print, as compared with

the contrasts existing along the corresponding line drawn across the original view, shown in Fig. 5. The result is flat. Now, I have introduced a corresponding jagged line in *dotted* lines in Fig. 6, by way of graphically illustrating how the contrasts involved in the same features and details would be made to rise and fall under the treatment of the hand-artist, supposing that the extreme contrasts he can command are the same as in the photograph. I shall not in this article discuss the power which the artist has of *leaving out* whatever details are undesirable or superfluous. Whatever features are important to the picture he can, if he wishes, paint in with a degree of boldness which, *photometrically* considered, involves a *violation of the light-scale*; and therefore the graphic curve representing his method is here and there much more jagged and emphasised than the curve indicating the same pictorial contrasts under photographic treatment. Although the light-scale is violated, yet the painting, etching, or engraving, or whatever it is, may yield to our vision a livelier sense of the real scene than any photograph can ever do, because the treatment humours those principles of vision which were illustrated in my last article, and is *not* based upon the unwarranted assumption that the human eye is a photometer. Were the eye capable of estimating or appreciating contrasts in direct proportion to their photometric value, then all possibility of representing a very considerable proportion of Nature's grandest scenes would be entirely out of the question, for, in that case, extreme contrasts of 1 to 40 or so on the canvas could never convey to the eye any adequate conception of a natural scene in which the extreme contrasts were as 1 to 100, or much more.

There are several corollaries resulting from the principles which we have arrived at which are well worth considering.

In the first place, we see a very good justification for some of those dodges adopted by many photographers both in exposing a plate and in printing. In photographing views in which beautiful skies are prominent, presenting, perhaps, very considerable contrasts when compared with the darker features of the view, it is

a very usual thing to employ a sky-flap, which secures that the upper and brightest part of the picture shall receive a very much shorter exposure than the foreground. The result is, when the plate is developed, that there is much less tendency for the sky to grow unprintably dense before the foreground is out. The action of the sky-flap is thus to very much lower the *extreme* contrasts of the negative picture, while leaving unaltered the contrasts in the details, and thus permit the photographer to use a much shorter exposure, or more plucky development, than he would otherwise have had to employ in order to secure a negative of proper printing contrast. The result of such treatment is therefore to allow the *features and details* of the view to be developed with greater emphasis. Or, supposing the sky-flap is not used, the same result precisely can be brought about by dodging the printing, and perhaps more successfully, since the photographer can find time to bestow pains on the operation.

When in Wales this autumn I kept on the look-out for a suitable landscape view with which I could illustrate, for this article, the result of manipulating the printing.* There is nothing remarkable about the view, which was taken looking up the Conway valley towards Bettys-y-Coed; but I secured it because the hills in the distance were bathed in sunlight, and also raised in the light-scale by the presence of a pearly atmospheric veil, while the sky presented considerable detail. The foreground and nearer distance were overshadowed by clouds, and a considerable amount of deep shadow was present under a grove of trees on the left. The view thus presented very considerable contrasts, or a tolerably extensive light-scale. My object was to secure two negatives: one sufficiently exposed to yield just that amount of printing density which would allow the sky and distance to sufficiently imprint their features, just as the fore-

* I learned, when too late, that bromide prints are ill suited for reproduction by the block process; consequently the two pictures are left out of this article.

ground had printed to its proper depth; while the other should receive a much shorter exposure, in order to secure a negative too hard for direct printing, and therefore requiring to be manipulated.

I secured two such negatives, one exposed as immediately as possible after the other. The difference in the extreme contrasts in the two negatives is very striking; but in both of them most of the details which were visible in the original scene are unmistakably reproduced, from the shadows up to the brightest parts of the sky. (As they were Wratten's Instantaneous plates, and not Isochromatic, the details which I noticed upon the most distant hills are barely recognisable, owing to the well-known effects of haze.) Now, the softer negative allows the shadows to print to their proper depth on bromide paper just as the details of the sky impress themselves. Nevertheless, *under those conditions*, I find it impossible to get anything else than flat and miserable prints, which are a libel upon the original. The light-scale is so compressed that the details have lost their natural relief. Of course, if the usual practice of sacrificing the sky by leaving it blank were resorted to, I could then give a much shorter exposure to the print, and thus secure the landscape part with a more natural degree of relief; but it is necessary, for the purposes of illustrating the principles discussed, that the sky should be assumed a necessary part of the picture. On taking the hard negative, and arranging for the densest parts, such as the sky and distant hills, receiving very much more exposure than the foreground, by means of a screen whose edge was kept moving, a print was obtained which shows the natural features and details of the view with a much higher degree of relief, reminding one more forcibly of the original scene, although the tops of the principal trees and the hills are rather too dark, owing to the fact that they have partaken largely of the extra exposure given to the sky, since I had not taken the trouble to make the masking closely follow the outlines of the darker features of the foreground and middle distance. In fact, the masking of the thinner parts of dense

negatives must be managed with very great care, thought, and patience, if the result is to betray no signs of the means employed, and give a really natural effect. Mr. H. P. Robinson, in his well-known work "Pictorial Effect in Photography," says, in effect, that the only way of adequately dealing with subjects presenting very extensive light-scales is to give up the attempt to grasp it all on one plate, and to expose two plates, one for securing the shadows and darker half-tones, and the other for the high lights and upper half-tones, and combine the two results in the printing. I understand that Mr. Robinson pursues this method in many of his best pictures, and certainly the results are remarkably successful. But the operations involved must require the highest skill and patience.

One of the practical conclusions to be derived from the principles that have been established is, that if we wish to do the greatest possible justice to landscape subjects which present great contrasts between foreground and distance, we should take care to photograph them when brilliantly lit up from one side by clear sunshine in such a manner that the sun illuminates distance and foreground alike; for under these conditions the effect is that the features and details of the view are mostly thrown up into strong relief, or their local contrasts much intensified, at the same time that the main or broad contrasts of the view are not altered from their intrinsic amount, since high lights and darker foreground partake alike of the extra illumination. Thus, when the general light-scale is compressed into the print, the local light contrasts involved in the details bear the accompanying flattening without so much tameness and insipidity resulting.

On the other hand, it is a great mistake to photograph such views when the high lights only are lit up by sunshine, while the foreground is in shadow; for then the broad contrasts of the picture are intensified, necessitating a still greater compression of the light-scale, with its accompanying tendency towards local flatness and blank shadows.

Turning now to that *largest* class of subjects in which the

natural light-scale is very little greater, or actually less, than that which can be commanded in photographic prints, we enter a field in which photography is at its best—in which no other art, excepting painting, can rival it for fidelity. Within the range of such subjects especially it is, however, an unfortunate fact that the usual type of photographer perpetrates some atrocious libels. For, just as it is possible to approximate towards obliteration of major details when the light-scale has to be compressed, so, on the other hand, it is notoriously possible to *accentuate* details to an aggressive and unnatural extent, when the small light-scale of the actual scene may be extended and enlarged up to and even beyond the limits possible in the print, for the sake of obtaining that brilliancy which is so often meretricious and out of place. Such subjects, in many cases, are so rich in naturally well-marked details, that to make a point of photographing them when generally illuminated by strong sunshine is one of the surest methods of courting that disagreeable aggressiveness of teeming details which is so destructive of the artistic quality of breadth. And yet other cases of such scenes with small light-scales may be named, which are far better photographed when the higher lights are well illuminated while the shadows are in shade. This is not contradiction, for, as a matter of fact, some sorts of details are not necessarily thrown into aggressive relief by sunshine, being what may be called flat surface details, which scarcely throw shadows. At the same time, the local illumination of the higher lights raises the general light-scale of the view, with the consequence that it has to be compressed in the printing, and thus any details which happen to be aggressive may receive some wholesome toning down, to the benefit of breadth of effect. Further examples need scarcely be given for bringing home to us all the necessity for the exercise of much thought and discrimination in determining whether any particular view will photograph best, and most artistically, under strong sunshine over the whole view, or sunshine only upon parts, or softened sunlight, or the diffused light of a grey day. There is no simple rule which will apply to all cases; we can only hope to arrive at right

conclusions on these important matters by the use of deductions from such principles as can be established, and the teaching of experience. Both methods working together are better than either alone.

I would here like to notice, as shortly as possible, two or three facts which seem, at first sight, to be opposed to the principle that the compression of the light-scale is necessarily accompanied by suppression of detail, other things being equal. There is a very prevalent idea among photographers that if two plates, A and B, are exposed simultaneously upon the same subject, A receiving a short and B a long exposure, A a strong and well-restrained development, and B a weak development, the results will be that A will be a hard dense negative, while B will be a soft negative, *full of detail*; it being generally thought that B will be *richer in detail* than A—that, in fact, development of density or contrast may take place independently of the growth of detail.

This, however, is absolutely and radically impossible in the above sense. But it is true in the *printing* sense. Let the two negatives be compared together against a good light, and let it be supposed that the details of the highest lights, as well as those in the deepest shadows, are present in *both* negatives (and neither of them are worthy to be called negatives unless that is the case). It will then be found that all the details throughout the denser negative, A, are depicted more vigorously, and with more "sparkle," as it is termed, than in the softer negative, B. And yet A may be utterly useless for printing purposes, without dodging, for the shadows print themselves black, and consequently *lose their details*, while the high lights yet show no trace of an impression. Therefore the result is a soot-and-whitewash effect, only presenting details in the middle tones of the picture; but those details, be it marked, are depicted with perhaps aggressive boldness. On the other hand, a print from B will exhibit details throughout the picture, from the highest lights down to the deepest shadows, although they will be registered with greater softness than those in the other print, and very likely with indistinctness.

Again, negative A may be so bungled in exposure or development, that, in vain attempts to get the shadows out, the high lights have got over-developed, and perhaps the whole film reduced, the effect being that only the half-tones present any details at all ; and how exceedingly well marked and aggressive those details are, all who have had much experience can bear witness to. The above facts, then, fully account for the common inaccurate notion that density and distinctness of detail are qualities which can be aimed at independently of one another, and are in no sense opposed to the principle which I have tried to establish.

Again, it may be urged as an apparent objection, that many views of snow-clad mountain summits among the Alps and other snow scenes have been photographed with the greatest success, in spite of the great contrasts involved. As a matter of fact, it can generally be shown that in these cases the contrasts are not nearly so great as the eye is apt to suppose. They are generally scenes in which the sunshine illuminates impartially both the snow and ice, and also the bare rocks which protrude between. They are generally views of an open nature, permitting of this condition. The brilliantly white snow shows in immediate juxtaposition with the dark rocks and herbage between, and so great is the eye's sense of contrast heightened by that fact, that it is utterly deceived as to the photometric amount of that contrast. As a matter of fact, since both the snow and the dark objects between are subject to much the same condition of illumination, the difference in their photometric intensities is therefore identical with their intrinsic reflecting powers, which can be shown not to be greater than as 1 to 12, or 1 to 20 at the outside, and this is just the amount of contrast which can be so successfully dealt with by photography.

Again, it is so well known as to scarcely need proof that many interiors of buildings, such as churches, present very extensive light-scales indeed ; the photometric contrast between the high-lights of an east window, for instance, and the darkest details which the eye can make out in the shadows, being perhaps as

200 to 1, or even more. (It is of course supposed that the windows concerned are included in the view.) This could be proved to be a very *moderate* statement of the truth regarding many badly lighted interiors. How is it then, it may be asked, that good, well-exposed photographs of such interiors often show the major features and details so distinctly, when the light-scale has to be so very much compressed to get it into the print? This may be explained by the fact that those interiors which present the most extensive light-scales are, in the very nature of the case, those in which the light is furnished chiefly from one source, most likely an east or west window. The sources of illumination are identical with some, or all, of the high-lights themselves. And if the source of light is so local in its direction, the inevitable result is that all those substantial details of pulpits, pews, carved woodwork and beams, etc., in the roof, are thrown into very strong relief by necessarily hard illumination. An extensive light-scale implies, and is caused by, illumination from chiefly one source, and a one-sided illumination implies emphasised light-contrasts in the major details; and therefore it follows that the general light-scales can be very much compressed without so great an obliteration of the major details as might be expected. On the other hand, if the interior is illuminated by many windows, powerful shadows are prevented, and the general light-scale or range of contrasts is lowered in proportion, at the same time that the major details are illuminated by a softer light. It is, then, a general principle, although perhaps not without exceptions, that the details and features of interiors are subjected to hard illumination, or to soft illumination, according to whether the scale of extreme contrasts is extensive or moderate. It is owing, I believe, to this principle that interiors, some of which present a most exceptional range of contrast, may be depicted by photography with tolerable success.

This article would be incomplete if I did not point out that the main principles arrived at form a very powerful argument in favour of transparencies and lantern-slides, as furnishing the

only means, within the reach of simple photography, of doing real justice to natural scenes characterised by a very extensive light-scale. For the amount of light which can be passed through a transparency, and projected through a lantern-slide, is theoretically unlimited; and, moreover, is never interfered with, or need not be interfered with, by any stray light scattered and reflected from the surface of the film in that direction from which it is viewed. It is the latter difficulty of surface-reflected light which renders it impossible and useless to carry the shadows of a print below a certain depth, the utmost contrast available depending upon intrinsic *reflecting* powers, which are not more than 1 to 40. But the contrasts available in a transparency depend upon differences in intrinsic *transmitting* power only, which is quite a different thing. We can command as extensive a range of light and shade in transparencies as we can ever meet with in nature, and avail ourselves of it, so long as we can command a light strong enough to penetrate the densest parts in sufficient quantity to make an impression on the eye. Those who have had much experience of transparencies will be able to bear witness to the fact that, by their agency, natural scenes presenting great contrasts, and extensive light-scales, may be depicted with a fidelity to nature and an amount of relief in the major details which leave nothing to be desired. At the same time these qualities of the transparency give unsurpassed opportunities, not to be missed, to those amateur photographers who swear by "pluck and sparkle" for all subjects whatsoever. They fire off plates upon subjects presenting very moderate light-scales, and diligently work them up into lantern slides, characterised by an amount of hardness and aggressiveness enough to make an artist shudder. But there is no real reason why lantern-slides should not be artistic. Much prejudice against the lantern-slides is accounted for by associations of thought. The projection on a screen is not shown on a mounting and in a frame, and the shape of the picture has been too rigidly fixed by conventionalism, independently of the nature of the subject; while, at the same time, the onlooker is often

distracted by the sight of ugly wooden frames, props, and tackle, which serve very well to hold up the screen, but are ill adapted for the surroundings of a picture. Add again to these things the uncomfortable and unsociable feeling of being in the dark, and we must realise that the lantern-slide has very many extraneous disadvantages which tell very much against it. Almost needless to say, some of them might easily be done away with.

H. DENNIS TAYLOR.

NEGATIVES, AND SOME SUGGESTIONS UPON THEIR AFTER-TREATMENT.

THERE are some photographers who affect to regard with contempt any after-treatment of a negative with a view to the improvement of its printing qualities, and whenever the opportunity occurs they condemn the practice in unmeasured terms. Therefore in approaching this subject I am fully aware that it is one of a more or less controversial nature. My chief object, however, in penning this article is not to deal with the matter from its debatable point of view, but rather to discuss, in a practical manner, some of the methods by which a negative may be rendered capable of giving prints showing a more truthful rendering of the subject than might otherwise be attainable.

The primary aim of the photographer should be, without doubt, to produce by careful exposure and suitable development a negative as nearly approximating to perfection as the at present imperfect means in his possession will allow. But we all know how seldom it is that expectations in this respect are fully realised, and how frequently the most careful consideration and reflection ends in comparative failure, or, at any rate, the result attained falls far short of the ideal which was aimed at. If this be accepted—and it is difficult to conceive any argument which would warrant its rejection—it follows, almost as a natural sequence, that if by suitable after-treatment it is possible to improve the printing qualities of our negatives, and to render them capable of producing prints which are more faithful reproductions of the subjects portrayed, I shall have gone far towards establishing the legitimacy of the methods which I am about to advocate.

I am not addressing those whose *ultima thule* is the production

of that "Will-o'-the-wisp" of the photographer, a good technical negative, nor those whose aim is to secure mere topographical reproductions of the scenes before which they may present their cameras, but rather those who, using photography as an artist does his colours and brush, work with some definite object in view and seek to reproduce some studied effect. I have referred in somewhat disparaging terms to what is ordinarily known as "a good technical negative," but I do so advisedly, for how often, I would ask, are prints which are really artistic produced from negatives of such a character? The term is, moreover, a misleading one, and the sooner it is abandoned the better. The prettiest-looking negatives rarely yield the most satisfactory prints. Surely the quality of a negative should be judged by the excellence of the prints obtainable from it!—the negative itself is merely a means to an end. For instance, if the effect sought to be attained be low in tone, then must the negative which is to reproduce it lack one of the attributes essential to perfect technique, viewed from the narrow standpoint; but such a negative, in that it reproduces the effect sought for, is, in my opinion, none the less entitled to be considered "perfect."

The ability of the photographer and his claims to rank as an artist should and must be determined, not by his particular methods —be they what they may—but by his finished productions. The acquirement of the mere *technique* of photography is practically within the grasp of any who care to place themselves under the requisite supervision and guidance, and who are prepared to devote the necessary amount of time to the matter. But something beyond this is necessary to make a man an artist, and it is just this "something" which makes the work of comparatively few, out of the legions of those who now practise photography, stand out with a prominence which defies comparison or criticism. The "something" may be the result of culture or of art training, or it may exist, as frequently happens, innate in the mind, waiting, perhaps, for a favourable opportunity to develop, but there it must be. That artists are "born" and not "made" is, to my mind, a

self-evident truism. And may it not well be that those who, as photographers, fill us with admiration by the beauty, artistic feeling, and expression of their productions, would, if circumstances had been favourable, have achieved fame as painters?

Now, it is with the view of helping the many who, possessing this necessary artistic perception—this power of selection and observation—have taken up photography, yet have learnt to recognise its shortcomings and failures in reproducing the particular effects which have been sought, by pointing out to them how their negatives may be improved, that I have undertaken the writing of this article.

For the sake of convenience I propose to classify the different methods of "dodging," or altering, or modifying the character of the negative under two headings: those attainable by chemical means, and those which may be effected by mechanical methods.

Among the first I need give but passing reference to controlling the development of any portion, or portions, of a negative during the actual process of development, for such methods are pretty generally known. For instance, it is possible in this way to secure both landscape and sky in one negative capable of giving a harmonious print, by simply removing the plate from the developer, and thoroughly washing it under the tap directly the sky has attained sufficient density, the landscape portion of the negative being then brought out by tilting the developing dish so that the developer only covers that particular portion of the plate.

Again, much may often be done in the way of improving a negative by resorting to "local development," coaxing out detail in those portions of the plate that seem to require it, by applying to them a brush charged with a developer containing a large proportion of accelerator, or, in the converse case, of portions being over-exposed, applying by the same means a 40-grain solution of bromide of potassium. Such methods, though known, are not, I fancy, resorted to by the majority; yet I believe it is by paying attention to such details as these that some workers succeed where others fail.

There is a certain type of negative which one frequently

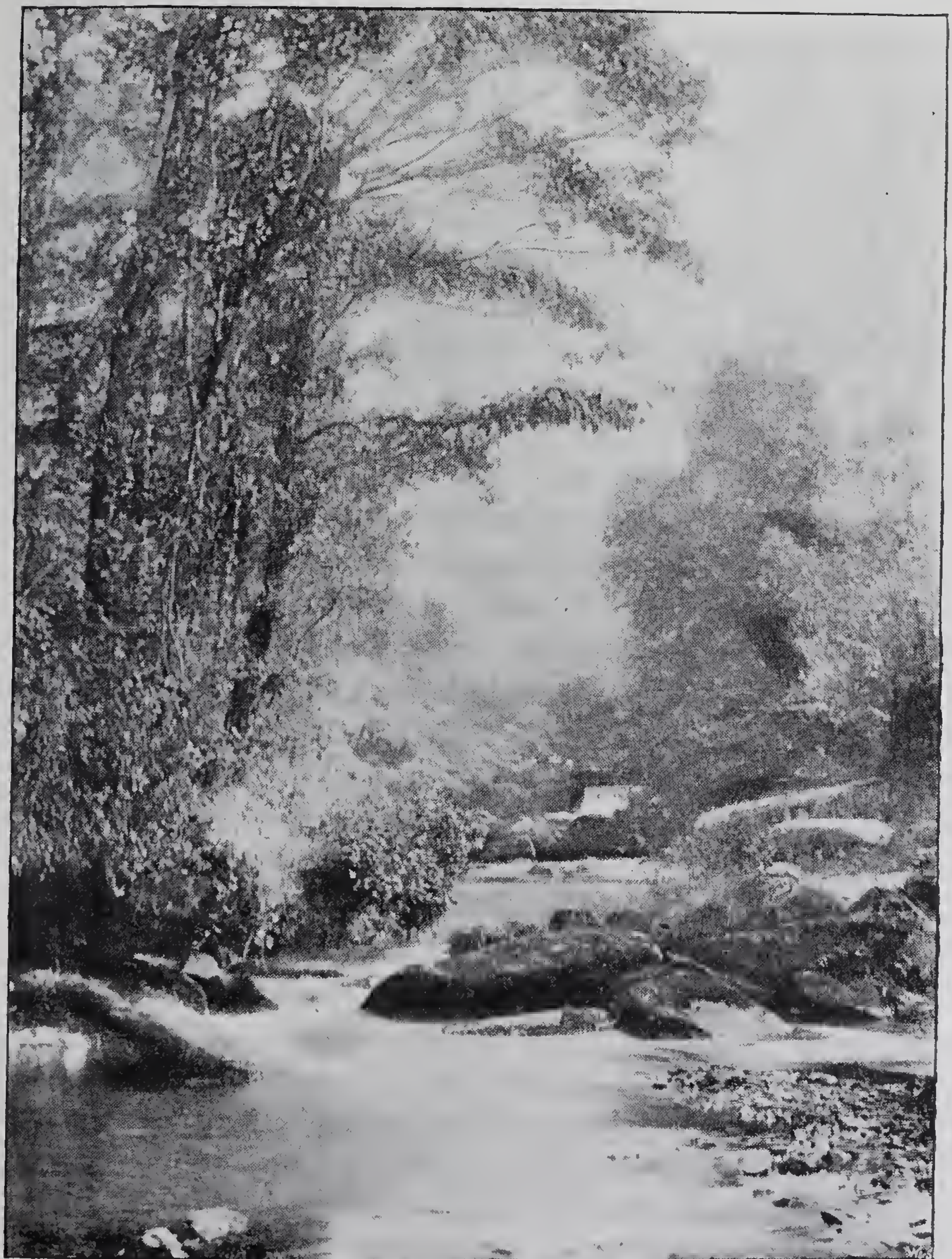


FIG. 1.

meets with (particularly if much interior work be attempted) which,

while not being very much under-exposed, yet, owing perhaps to the disposition of the light and shade, renders a good print very difficult to obtain. Such a negative, if printed from without further treatment, will probably yield a print deficient in half-tone and with hard high-lights. It is extremely difficult sometimes, and particularly when Isochromatic plates are used, to succeed in getting out the detail in the shadows and more delicate half-tones, without unduly blocking the high-lights. Particularly is this so when photographing interiors, when, as is often the case, the whitewash brush has been unsparingly used, and where, in conjunction with whitewashed walls, one finds oak-wainscoting and furniture dark with age. However prolonged the exposure, it will be found difficult, if not impossible, by mere development to produce a really harmonious negative. The developer, of course, must be very considerably modified; indeed, I have frequently reduced the pyro. down to as little as half a grain per ounce, but even then have failed in getting the result aimed at. Let it be assumed that the attempt to photograph such a subject as the one I have indicated has resulted in a negative in which the shadows print too deeply, obliterating all fine detail, and in which the high-lights are blocked. Now, in such a case the printing qualities of the negative may be immensely improved by the following treatment, which I believe to be novel, but which I know to be successful. After a thorough washing, and preferably before drying (though this is not essential if the plate be thoroughly soaked in clean water for about an hour), the negative is intensified with the original Uranium Intensifier. I say "original" because I find this solution acts most satisfactorily as an intensifier without the addition of acetic acid, as it is now recommended to be used for the toning of bromide prints. After the negative has been dried (and merely for educational purposes) a print may be taken from it in which a great improvement in the shadows will be manifest; but, on the other hand, the high-lights will probably be even worse than before, so that up to this point the improvement will have been rather of a negative character. But now the special

utility of the Uranium method of intensification comes in. It is well known that the effect of this intensifier can be obliterated by the application of any alkaline solution, and this property is turned to practical account by painting over with a camel's-hair brush, charged with a weak solution of ammonia, those portions of the negative which are over-dense. This treatment completely discharges the red colour, and brings the parts so treated to their original printing value. The negative should then be well washed, and, if the dense portions require it, they may be reduced by the local application of any of the well-known reducers; personally, I prefer Farmer's solution, composed of ferri-cyanide of potassium and hypo. The appearance of a negative which has been so treated will probably not create a very favourable impression; but, if the different operations have been carefully carried out, the marked improvement in the prints producible from it will render its "appearance" a matter of very secondary importance. This striving after what is in many cases a false standard of excellence is really very often a direct hindrance to advancement. The negative, as I have said, is only a means to an end, though many seem to regard it as though it were the end and aim of all photography. This should not be; the unavoidable limitations of photography are sufficiently numerous without the photographer creating for himself additional ones. The rationale of the above process is, perhaps, sufficiently obvious, the object being to strengthen the shadows and the deficient half-tones, without altering the value of the high-lights, or when necessary lowering the latter. The operation, though somewhat lengthy to describe, is very short, and is simplicity itself; moreover, if the effect desired be not attained, by simply immersing the plate in a weak alkaline solution it will be restored to its original condition, and operations may be begun *de novo*. The Editor has been kind enough to have two prints from the same negative before and after treatment reproduced, and though the full advantage of the method is not so apparent in the reproduction as in the direct print, yet a mere glance at the two must convince the reader of the

superiority of the one which has been "dodged." The subject was not an easy one from a photographic point of view. Although the composition was in itself good, the strong feature of the view was the beautiful effect of light and shade. As is frequently the case in photographing glen scenery, I was very cramped for space, and the employment of a wide-angle lens became necessary; this, with the sun in the necessary position to secure the effect of lighting aimed at (almost in front), gave me a decided flare spot, which was ultimately overcome by temporarily lengthening the hood of the lens by rolling round it a piece of letter paper and securing it with an indiarubber band. The image on the screen exhibited strong contrasts of light and shade, which I knew would be exaggerated by the photographic process. A full exposure was therefore determined upon. The lens was working at $f/16$, and an exposure of 10 seconds was given while the sun was shining brilliantly, followed by an auxiliary exposure of 20 seconds during an interval when the sun was obscured by a passing cloud. This may probably seem a full exposure to many who are not experienced in photographing this class of subject, but the resulting negative proved that too little rather than too much latitude had been allowed. A very weak developer, containing about 1 grain of pyro. to the ounce, was applied, and every precaution taken to prevent undue density; the high-lights on the foliage and the water quickly made their appearance, and rapidly acquired density, although detail in the shadows appeared but slowly. The developer, therefore, was further diluted by adding to it half its bulk of water and more ammonia. Development in the shadows then commenced, cautious additions of ammonia were made from time to time as occasion seemed to require, and in about half an hour development was arrested and the plate fixed. Upon examination it was found that although detail was fully out the lights were heavy and blocked, and a print made from the negative at this stage produced the unsatisfactory result shown in fig. 1. It was then determined to ascertain whether by "doctoring" any improvement could be effected. The negative was accordingly

subjected to the treatment already described in detail, with the

FIG. 2.

result that a print was then obtainable from it which gave a fairly

truthful rendering of the subject, and which is reproduced in the second illustration. The method is applicable to any kind of subject, and is quite distinct from mere intensification or reduction, either of which processes would only have increased the original defects. Nor would it have been possible, by increasing the exposure, to have obtained the effect sought for, which depended, as I have said, upon the peculiar lighting of the view and the striking contrast of light and shade. As I have already hinted, exception will probably be taken to the adoption of such methods; but I would ask whether, when the artistic instincts of the photographer enable him to recognise a fault, and a remedy is placed in his hands, it is not mere carping criticism to question its legitimacy, and seek to restrain him from availing himself of its advantages?

I turn now to what I have called "mechanical" methods, and I will refer in passing to one that is practised by most photographers —namely, the reduction of the density of any particular portion of the negative by rubbing down with a rag moistened in alcohol or methylated spirit. This, however, is a remedy which requires to be used with very great caution, for if not carefully and skilfully done the negative may be easily made worse than it was originally. The friction of the rag removes the upper layers of the film, and unless great care be exercised the removal of the deposit will be unequal; with some films (particularly those in which a soft variety of gelatine has been employed) such treatment is always attended with danger, and local reduction by chemical means is much to be perferred.

Very much improvement may be effected in some negatives by the use of an ordinary "retouching pencil" on the film. I am not, of course, referring to portraiture, but to landscape and interior work generally. For this purpose pencils of varying degrees of hardness will be required,—very much harder than those ordinarily employed for drawing upon paper,—and the surface of the negative must be prepared in order that the pencil may "bite." Any ordinary retouching varnish may be employed for this purpose, or

an alternative (and, in my opinion, equally effective method) is to lightly rub with the tip of the fingers, using a light circular motion, a little of the finest powdered resin upon those portions of the negative on which it is desired to work. A great deal of improvement may be effected in this way—the smaller high-lights may be accentuated, details strengthened in deep shadows, and surface-lights introduced in still water, all of which, if skilfully done, will vastly improve the general effect of the picture.

Some negatives, and especially those which may be either a trifle under- or over-exposed, may have their printing qualities greatly improved by coating their backs with "matt" or "ground glass" varnish. Further improvement in such cases can be effected by using a retouching pencil (in this case a much softer grade, perhaps even a *B* or *B B*) on the matt-surface after it has been allowed to become thoroughly dry and hard. I prefer, however, when "dodging" a negative in this way, to use tissue paper, or a fine foreign paper known as "papier mineral," as a basis for my retouching operations, because I find it will allow of more vigorous treatment than will the matt varnish, which is rather liable at times to rub or chip off under the pressure of the pencil. I rub over the back of the negative with gum or paste—it matters not which—and while the surface is still wet I apply to it a piece of ordinary tissue paper or a piece of the papier mineral. It will require a little skill to do this properly (which, however, a very small amount of practice will impart), in order that no ridges or creases may result. The negative so treated may be allowed to dry spontaneously, or it may be dried over a gas flame or in front of a fire. It may then be worked upon to any extent that may be deemed necessary by means of a crayon and stump, or with lead-pencils of different grades ranging from HB to BBB. It is impossible to give more specific directions "how to do it," but the method being indicated, very little experience will enable any one to vastly improve the printing qualities of even good negatives. It is unnecessary to mention that all or any of these different methods may be used in combina-

tion in order to make the most of a particular negative and to secure a desired result.

It may be objected by some that the adoption of these methods involves a considerable amount of trouble: for such objectors these suggestions are not intended; to the earnest worker the improvements attained will be deemed sufficient recompense.

JOHN A. HODGES.

IS A THEORY OF PICTORIAL ART POSSIBLE?

IT has been taken for granted now for such a long time that Science and Art are to a very great extent independent of, not to say opposed to, each other, that any other view will be regarded by the majority as "not worth two thoughts." Still, I venture to hope that there may be found a saving remnant who are disposed to hear an appeal against that sweeping judgment, as widely accepted perhaps as it is gratuitously formed. For the purpose of the present inquiry it will not be necessary to define sharply the two terms, Science and Art, but to agree that they shall be used very much in the sense they are usually applied to the Science of Acoustics—*i.e.*, the theory of musical sounds—and to the Art of Instrumental Music. It will, I trust, be readily admitted by those of my readers who have any practical knowledge of what is known among musicians as the "theory of Music"—*i.e.*, scale relations, intervals, pitch, key, harmony, contrapuntal structure, form, etc., etc.—that this "theory" has a well-marked and intimate relationship to the art of music. In other words, it will be generally admitted that the great masters were not only familiar with many of the chief and leading principles, but further, that their work shows signs of having been constructed in general accordance with their principles. It may be replied that our present knowledge of much that is known as "form, etc.," is nothing more than "generalisations" gleaned from the classical works of the masters. Granting this to be the case, we are thence led to conclude that the practical agreement and general similarity among the various writers tend to strengthen the argument that they worked upon principle. Furthermore, it may even be admitted that various items of knowledge are of recent discovery,

i.e., were probably unknown to the earlier masters; yet this fact only goes to show that methods and forms intuitively known to, or at any rate used by, them are shown to us to rest on a more accurate basis. Finally, the well-known work of Helmholtz, Sedley Taylor, and others, tending to establish the scientific (*i.e.*, mathematical) basis of much that was known to and employed by musical writers, is an advance towards bringing into a closer and more friendly relationship the Science, or Theory, and the Art of Music.

It need hardly be said that I refrain from replying to the thread-bare tag, "The theory of music will not make a Beethoven"—a truism on a par with its companion, "A knowledge of pictorial composition will not make a painter." And this for the simple reason that no "intelligent reader" would blunder into such mental chaos—unless perhaps he had wilfully shut his eyes to the obvious converse, that a knowledge of English grammar, *κ. τ. λ*, etc., did not prevent Milton, Macaulay, Tennyson, and others from presenting the products of their genius in a form which has multiplied the creations of their brains ten-thousand fold.

Parker ("Nature of the Fine Arts") says: "Now, though it is quite certain that there is a science of music, and that music is consequently one of the Liberal Arts, there is no such certainty as regards painting. It is, on the contrary, quite certain that there is not, and never can be, a science of painting in the sense in which there is a science of music." The grounds for this "is not, and never can be," seem to be somewhat as follows.

Firstly, that Sounds "can be divided under two heads—noises and musical sounds," and that, although they cannot be very accurately separated or sharply defined, yet there is a distinction sufficient for the purpose enabling one to say what shall and shall not be admitted as musical sound. This is, I think, at least open to a variation of opinion. The same writer goes on to state, "No such subdivision of colour is possible. All colours are the property of the painter." Here at least there will be but few, if any, who do not agree with the latter statement. At the same time, while

admitting that a painter may, if he choose, employ any pigment at his command, it may be said that there are surely some colours that are "noisy" rather than melodious. A few years ago there was a shrill colour that we all knew so well and, like the ubiquitous barrel-organ, liked so little—viz., magenta. The employment of this colour by painters of the first rank is, if anything, more rare than the clang of the cymbals in classical music. On the other hand, there is an apparent fitness of things observable, or at least suggested, by the rattle and glint of arms, fiery red uniform, clang of cymbals, and roll of drum.

Secondly, the writer says: "Music can be written. Colours can be stated in language only in an exceedingly imperfect way, which is quite inadequate for scientific purposes. Colour is continuous, sound is discrete." There are here three separate points. As regards the first, it is obviously true, taken in a very broad and general sense. At the same time let it not be forgotten that music can only be imperfectly written. The composer may point the notes and give marks of expression, time, accent, etc. Half a dozen different performers may play from this manuscript and yield just six interpretations, every one of which is quite out of harmony with what the composer would desire to be rendered. If this is so in music for keyed instruments, what must be the case with, say, the violin? What, again, with the voice? This leads our thoughts into the third sentence just quoted. Possibly I may mistake the writer when I assume that he is here using the word "discrete" as an autonym to continuous. But, if that assumption is correct, I think it can only be applied to music for keyed instruments, in which the notes are, so to speak, fixed. It would hardly apply to, say, a "slur" for a violin or the voice.

[Space does not permit a digression at this point as to whether gradation, *e.g.*, slur, modulation, suspension, etc., is not a physiological condition of æsthetic sensation and perception. The question is one of great interest, but would demand separate treatment.]

It is, however, with the second of the three statements that we are now chiefly concerned—viz., that colour cannot be stated with scientific accuracy. On this point it will be quite sufficient to refer the reader to chapter xiii. of Abney's "Colour Measurement and Mixture," where he will find that a quantitative colour analysis is given of, among other things, two samples of brown paper. Familiar experience tells us that "brown" paper may be of almost any tint between black and white, and that one seldom sees two different makers' "brown" paper of exactly the same colour. If then such a variable term as brown can be quantitatively assigned, it is obvious that colour compares favourably with pitch of sound as regards its scientific treatment. It may even be suggested that, with Abney's results before us, it would be, if anything, easier to state quantitatively the colour of a "fair maiden's deep blue eye" than to analyse the tones and overtones which together build up the timbre of her voice-notes.

> "Her sweet voice
> Is like the rich music of a summer bird
> Heard in the still night with its passionate cadence."
>
> LONGFELLOW.

Are not Byron's words true?—

> "The Devil hath not in all his quivers choice
> An arrow for the heart like a sweet voice."

Parker, after referring to some side issues as regards colour contrast, the hypothetical existence of the vibrations causing visual sensations, etc., goes on to say: "The condition of a true science is that it should contain propositions the terms of which have a definite meaning. We find this condition fulfilled in music."

When composing a piece of music and a picture it is important to remember that the former appeals to us through the ear by a succession of sense impressions following each other in order and time. A picture, on the other hand, appeals to us as a whole; and, although some brief time is required for the eye to wander from point to point and collect the several impressions, yet the

actual time taken up is comparatively brief, and is not an essential element in the collective impression. Again, the eye may take its points in its own order, returning again and again, if need be, to this or that part. This is in contrast to a musical composition—the melody and harmony are fixed as regards the order of their reception—the intervals of time separating the phases of impression are of vital importance—in fact, what order and time are in music, so in many respects, *mutatis mutandis*, is the element of perspective in vision. In both cases the several impressions have their own *relative* value. The proportions of their respective importance are of primary value. This is again true in all literary work, fiction, poetry; and again, still more emphatically, in the dramatic and operatic arts, both of which appeal to the eye in a series of ever-changing pictures accompanying a stream of sensory impressions received through the ear. Parker has the following: "Nevertheless there is a true science which is related to painting as harmonic to music, though in a less degree. This is perspective." It will be seen from this alone that the present writer differs somewhat from the last quotation, but only in a minor matter—*i.e.*, as regards the comparison of perspective and harmony.

To put the matter briefly, it may, I trust, be assumed that pictorial art consists primarily of two great divisions—viz., *form*, as expressed by line, contour, etc.; and *colour*, including light and shade.

Assuming for one moment that the artist's perspective is identical with that based upon geometrical science, it is a conceivable possibility that this could be reduced to precise statement, quantitatively determined. It may be granted that it is at present only practicable for the simplest rectilinear forms. Still, the limitations are due to lack of knowledge, etc., rather than inherent in the thing conceived.

Many artists are by no means willing to admit that artistic and mathematical perspective are quite the same thing, but support the view that the former is somewhat of the nature of a blend, formed

by assuming the plane of the picture to move through an assignable distance. If this view be held, very considerable difficulties are introduced; but they are not of the nature to exclude the possibility of success. As a matter of fact, under present average knowledge it is a simpler process to draw what shall be accepted as a representation of, say, an ellipse or spiral as seen in perspective, than it would be to apply the ordinary methods of perspective drawing. At the same time it may not therefrom be concluded that the training gained by a careful and mathematically accurate perspective drawing of some simpler forms does not very materially assist the unaided eye in drawing more complex and subtle forms. One may roughly compare the relative positions of scientific and artistic drawing by a transference of mental image. Given a boatman, sailor, or fisherman, with a fair share of experience and intelligence; ask him how long it will take to sail from this point to that, with a given boat, sails, tide, wind, cargo, etc., etc. Put the same problem before an expert mathematician. The issue may show the boatman's opinion to be the more correct, but even then there must ever be present the feeling of uncertainty, a general hard-to-define mistrust of the "guessy" nature of his methods. On the other hand, the mathematician may, from lack of sufficient knowledge or data, fail to give due preponderance to this or that element. Yet his method fails, not because of its inherent capacity, but of the user's limitation of knowledge. No unprejudiced mind can fail to perceive that as the sister sciences of physiological and mathematical optics and psychology advance so will the records of impressions and sensations gain in accuracy. It is by no means a vain hope that the scientist may some day be able to explain, *i.e.*, connect taste with chemical and physiological data. In the same way it may be hoped that we are within a reasonable possibility of showing that much of our sensation of form—*i.e.*, the straight line and the curve—may be reduced to order and admit of definite proportional statement.

As regards colour (light and shade) this has (*vide supra*) been shown to be capable of definite quantitative statement—or, at any

rate, as definite as that concerned with the pitch of musical note. The two matters stand very much on a par. For instance, a certain musical sound may be resolved into a fundamental tone with an analysable series of supertones or harmonies; these can be fixed by the number of vibrations per second. In a somewhat similar way a colour can be split up into a mixture of two or more tints, in relative strengths, quantities, and the quality of those component tints may be stated in wave-lengths. Thus it may be said that in music there is a scientific substructure capable of being quantitatively considered—*e.g.*, pitch, timbre, time, order, harmony, form in composition. Similarly in pictorial art form (*i.e.* line and contour) and colour (*i.e.* tint, saturation, tone), may be reduced to definite statement. Hence, if we recognise a *Theory* of Musicas having any connection with the Composer's *Art*, I fail to see why we should not grant a similar position to a Theory of the Pictorial (this for want of a better name) with reference to the Painter's Art. To grant to the ear what is denied to the eye seems to be an "advance to the rear," and reminds one of mediæval medical practitioners who based their prescriptions upon the positions of the planets and ignored the corporeal symptoms.

F. C. LAMBERT.

AMONG THE TOWERS OF SOMERSET.

WHILE there is scarcely any district in England entirely destitute of ecclesiastical buildings that are worthy of the notice of the photographer who makes architecture his especial study, yet there are two in which interesting and beautiful churches are more thickly crowded together than elsewhere. Of one of these districts I have already given a sketch in an article in the PHOTOGRAPHIC QUARTERLY,* the other will form the subject of the present article. Situated on opposite sides of England, Northamptonshire and the county of Somerset present very striking differences in many points, and especially in their churches. In the richness of its remains of early times Northamptonshire must bear away the palm. The western county has nothing that she can set against the Roman work at Brixworth, or the Saxon towers at Barnack and Earl's Barton; of Norman work little is to be met with, and Early English only to any extent in the ruined abbey at Glastonbury and the neighbouring cathedral at Wells; nor are buildings of the Decorated period abundant; but during Perpendicular times—that is, during the reigns of the Lancastrian, Yorkist and Early Tudor monarchs—Somerset burst out into luxuriant architecture, and everywhere large parish churches rose, with stately towers commanding wide views across the level flats bounded by the picturesque hills which diversify the face of the county. We may well regret the disappearance of nearly all the work of that early age when the land of the Sumorsætas was emerging from the mist of legends,—legends connected with Joseph of Arimathæa and the half mythical hero of the Keltic race, whom the Laureate in an idealised form has made to live once more. We would gladly see some traces of

* "A Ramble in Spireland," vol. iii., p. 51.

the monastery founded by Alfred at Athelney, which even now in wet weather almost deserves the name it bears of Isle, a land of level meadow intersected by rhines or dykes, fringed with osiers, where we may see the osier-peelers working in the same way as that represented and described in Dr. Emerson's well-known "Pictures of East Anglian Life"; we would gladly find some portions of the original abbey where Dunstan worked and prayed and ruled; but we shall seek them in vain. Alfred's foundation is entirely gone, Dunstan's church has been succeeded by another and that by yet another; fire did its destructive work in olden time, and the roadmaker and mason of modern days have used the old disendowed monasteries as quarries; and had not, fortunately, a greater love for antiquity arisen in the present century, Glastonbury would have been as Athelney. But we must be thankful for what still remains—the noble churches whose carving had not lost its first sharpness when Sebastian Cabot, on May 2nd, 1497, on board the good ship *Matthew*, set sail from Bristol harbour on his memorable voyage, and whose towers had begun to grow mellow from the influence of sun and showers, and the tender growth of lichen, when the Royalist guns woke the echoes of the Quantocks and the Blackdowns round Taunton, which Blake so stubbornly defended, and which looked down some forty years later on the massacre of the brave West-countrymen who had espoused the hopeless cause of Monmouth.

Taunton will be found an excellent centre for photographic work; the country immediately surrounding it is exceedingly pretty, the river Tone meanders through the wide valley, and many a nice little bit may be found on its banks. Field paths abound in the district, and from Taunton station railways run in several directions—to Exeter and to Bristol, to Minehead, to Ilfracombe, to Yeovil, and to Ilminster—and so give easy access to many villages and small towns, in nearly every one of which is a church well worth a visit and the exposure of several plates. And it is well to bear in mind that the photographer should not be satisfied with views of the exteriors of these churches, for in many of them

splendid wood carving may be found, the richly decorated screens being especially characteristic of Somerset architecture.

Before starting from Taunton to explore the villages around, a day or two may be spent on the town itself: its castle, dating from the days of the old Wessex kings, which gained an unenviable notoriety in the days of James II., when Jeffreys held the Bloody

ST. MARY'S, TAUNTON.

Assize within its walls, is worthy of notice, and so is the Church of St. Mary Magdalen, with its magnificent tower so elaborately carved, its pierced and battlemented parapet, its pierced and flying pinnacles. The tower, beautiful and striking as it is, is not old, but is an exact copy of the old tower, which, having become unsafe, was pulled down about thirty years ago. The best view of the

tower is from the west; unfortunately, the street leading to it is extremely ugly; on either side is a straight row of uniform houses with nothing to break the sky line. A sunny day about one o'clock will be the best time for this view, as the shadows fall at that time in such a way as to bring out the rich carved work of the red sandstone tower with its facings of yellow stone. The church should also be taken from the south-east, inside the churchyard; the interior, too, is very fine, with its double aisle on either side of the nave, and dark oak roof to which full justice can only be done when snow is on the ground outside, reflecting light through the windows up to the black beams. The south porch from the exterior makes a good view. The church dates from the days of Henry VII., and the tower may be taken as a type of one of the classes common in Somerset; it has a staircase at one corner, and double buttresses at the others, the pinnacles at all the four corners being of equal height. The neighbouring Church of St. James, less elaborate in workmanship, is like St. Mary's in the fact of having had its tower recently rebuilt. A walk through some delightful country lanes to the south of the town will bring us to Trull, with a plain tower, in which buttresses are dispensed with, and the requisite strength obtained by making the walls batter or slope gently inwards, and with an interior noteworthy for its carved screen and old oak pulpit; from Trull it is worth while to go on about two miles farther to Pitminster, where a spire, a rare thing for Somerset, will be found.

Our other excursions will be made by train; and first, we will explore the Minehead branch. We must stay awhile at the second station, Bishop's Lydeard, to examine the church, with a tower built in a severer and simpler style than those of Taunton, and the churchyard cross; and then take train again for Watchet, where not only shall we find St. Decuman's Church on the hill worth a plate, but plenty of subjects of another kind on the pier and beach; for Watchet is not a fashionable place, and its pier was built for sailors, not for visitors. Then we must press on, and continuing our journey to the next station, Washford, we

must halt again, and we shall be amply repaid for a quarter of a mile's walk by being able to photograph the ruins of Cleeve Abbey; a charge is made for admission, but no objection is raised to the use of a camera. We have here the remains of the refectory in a very good state of preservation, with its timber roof and traces of a large fresco of the Crucifixion on the wall opposite the entrance, and windows with transoms which seem to have served as models for many of the church windows in the district; the crypt, part of the cloisters, the abbot's seat, from which he used to watch the monks taking their exercise, are still to be seen; and as we leave the abbey, we cannot but admire the taste of these hard-working brethren of old in choosing this lovely valley, so peaceful, so fertile, as their abode; surely their lines were cast in pleasant places. From Cleeve Abbey it is well to walk to Blue Anchor, by way of the little village of Old Cleeve; for the church—Perpendicular, of course—is worth a plate on its own account, and it also groups well with some picturesque cottages; here, too, we have cottages with upper rooms projecting far out over the doorways, and supported on wooden pillars, and as we go on we see a cottage garden divided from the road by a luxuriant hedge of fuchsia trees, which grow in the western counties near the sea as nowhere else in England. Near Blue Anchor we find along the cliffs to the east fine examples of contorted stratification, a thick band of grey rock having been upheaved and folded, displacing in its upheaval the overlying beds of red sandstone, in which veins of alabaster may be seen. But our way lies westward by rail, or on foot, to Dunster, where a church, too much hemmed in by buildings for us to get a good exterior view, is of singular interest, on account of its handsome screen and certain peculiarities in its construction. It is, in fact, two churches in one; for owing to disputes between the monks and the parishioners, the church was divided, the monks retaining the choir and transepts as their priory church, while the parishioners used the nave as their parish church, with its own altar under the western arch of the central tower. The

photographer will scarcely tear himself away from the village of Dunster without paying attention to the quaint, conical-roofed market-house which stands in the principal street near its upper end, and possibly may be tempted to take a view from this same market-house looking down the street, and showing the castle in the middle distance. But when this has been done it will be well to go on to Minehead, about a mile by rail, to secure a view or two of the church, on the slope of the steep hill overhanging the town, with the weather-beaten Scotch firs in the churchyard, and the screen within the church. By this time, as probably the day's supply of plates will be exhausted, and the light be failing, nothing will remain to be done save to wait for the starting of the last train for Taunton; we will therefore take our place upon the beach and watch the sunset sky with the headland rising dark against it, and the twinkling lights in the cottage windows of the street that runs along the harbour, reflected in the waters of the flowing tide below, and the stars coming out in the northern sky, and the flashing or revolving lights on the Welsh coast, and possibly the rising moon lighting up the sky to the east. It is pleasant, after a long day's work at plate-exposing, to give ourselves up to the enjoyment of simply admiring the beauties of the evening—beauties which are so utterly beyond the powers of photography to express, that we feel no regret that no more unexposed plates are left, but are only glad that the train allows us to linger yet awhile and luxuriate in the beauty of that witching hour of eve, which, lovely everywhere, is nowhere lovelier than by the sea when no wind stirs its surface, and the rising waters, with their steel-like hue, break but in tiny ripples on the grey shingle of the beach.

Another expedition from Taunton—which, however, necessitates a walk of about twelve miles—may be made by taking the rail as far as Bridgewater, where there is one of the few churches in Somerset with a spire, but of which it is difficult to get a good view, and then making a circuit through the Zoys,—Chedzoy, Weston Zoyland with its lofty tower, and nave used as a prison for the rebel

soldiers captured in Sedgemoor fight, and Middle Zoy where we find an example of another type of tower, the staircase rising in a turret above the roof, the other pinnacles being less lofty; then on to Othery, with its wide belfry window, and back again to Taunton by way of Athelney, near which is East Lyng church, well worth a plate. This round will probably be sufficient for one day; but

HOLY CROSS CHURCH, MIDDLE ZOY.

the next station, Langport, between Athelney and Yeovil, should be visited, for close to this is Langport church, fine indeed, but quite eclipsed by its near neighbour Huish Episcopi, which has one of the loveliest towers in the county, with richly carved belfry windows; it stands on rising ground, and is rather difficult to take, requiring a camera and lens allowing a considerable rise in the front. About a mile from this are the remains of Muchelney

Abbey, now a farmhouse, a fine example of domestic Gothic; close by is Muchelney church, and the village cross, both good subjects for the photographer. About two miles on the other side of Langport is Curry Rivel; a pretty view can be obtained, from the village green, of the church and ivy-covered cottages and fine

ST. MARY'S, HUISH EPISCOPI.

chestnut trees, and if we go into the churchyard we shall find that both the north and south sides of the nave are fine; the tower, however, is new, built about thirty years ago, and is of greater height than the original was. The next station is Martock; near this is Martock church, with an Early English chancel and a Perpendicular nave, the most perfect in the county, with a fine

clerestory and niches inside between the clerestory windows. This church may be easily photographed from almost any point of view. A walk of about two miles will bring us to South Petherton, with its central octagonal tower ; and we may return to Martock by way of Kingsbury Episcopi, which has one of the most beautiful towers in the county and fine wood-carving inside. Yeovil church, too, is a fine one : the tower has a pierced parapet but no pinnacles, and a similar pierced parapet runs round the top of the nave. From Yeovil the London and South Western Railway will take us to Yeovil Junction, close to which is Bradford Abbas church, with a good tower at the west end and a fine western doorway ; and the remains of a cross in the churchyard, the tower from the west, the west doorway, the church itself taken from the road to the south-east, all make good pictures. On our way back to the station we pass Clifton Maybank, a manor-house of early sixteenth-century work, now used as a farmhouse, with a particularly handsome oriel window. Travelling towards Exeter we must break the journey at Crewkerne, where we shall find a large church with a central tower and a splendid west front. The peculiarities of this church are the turrets at the west with castellated parapets, and the side chapels which supply the place of side aisles ; there is ample space in the churchyard for taking several good views. The next station is Chard Junction, at which it will be well to leave the main line and travel along the branch line through Chard to Ilminster, where we must break our journey ; for not only does Ilminster possess a magnificent church itself, but there are several others in the neighbourhood which should by no means be left without a visit. The central tower of Ilminster is most richly carved, and good views may be obtained with a short-focussed lens from the south-east, south-west, and north-west. Ilton is worth a plate as we pass it on our way to Isle Abbots. This is a small, out-of-the-way village, five miles or more from any railway station, with a large church, singular from the fact that as yet the craze for restoration has not reached it (it is devoutly to be hoped that this fine building may long remain untouched) ; the western

tower with its niches and statues, the chancel dating from the period when the Early English was passing into the Decorated style, the north aisle with its rich Late Perpendicular work, all afford the opportunity of getting interesting photographs ; and as we go on to Hatch station, if our stock of plates is not yet exhausted, a view may be taken of Curry Mallett church, which we shall pass on our way. At Hatch we take train for Taunton. The round just described from Langport to Hatch will afford abundant work for two days. Another day may well be spent in going on foot

CHURCH OF ST. PETER AND ST. PAUL, NORTH CURRY.

from Athelney to Stoke St. Gregory, a peculiar church with central octagonal tower surmounted by a conical roof, and statues in niches in each of the faces of the tower, and then on to North Curry ; a handsome church with a low central octagonal tower having a pierced parapet round it, while a similar one runs along the roof of the nave and of the chancel. One or two good pictures may be taken of the interior ; the south porch and a peculiar flat-arched doorway on the north should also be photographed from the outside. Another short day's work would not be thrown away on Bradford, near Norton Fitzwarren station, and West Buckland, crowning a hill with its simple but impressive tower, and Wellington, the

exterior of which is well worth a plate. North Petherton, which can be reached either from Durston or Bridgewater, has a church and splendid tower, which should not be left unvisited, although it lies at some distance from either of the railway stations just mentioned.

But the district still to be described is the richest of all, and will afford work for several days as the photographer proceeds slowly, stopping at station after station to study the architecture of the churches, and here and there to devote a plate to the beautiful natural scenery through which he passes. Either by way of Highbridge by the Great Western and the Somerset and Dorset Railways, or by the new line of the Somerset and Dorset, which has a terminus at Bridgewater, Glastonbury may be reached. What visions does not this name call up! It is enshrined in the earliest Christian legends of the land. Who has not heard of the Holy Grail, which—

> "the good saint
> Arimathæan Joseph journeying brought
> To Glastonbury, where the winter thorn
> Blossoms at Christmas, mindful of our Lord"?

This indeed is—

> "the island-valley of Avilion;
> Where falls not hail, or rain, or any snow,
> Nor ever wind blows loudly; but it lies
> Deep-meadowed, happy, fair, with orchard lawns
> And bowery hollows crowned with summer sea,"—

to which, according to legend, the wounded Arthur was borne after that last great battle in the west.

It has long been a favourite spot of mine, and many a time have I visited it; and always, except on the last occasion, has the place kept up, as far as climate was concerned, the character given to it by Lord Tennyson; but then a fine rain was falling during part of the time that I was there.

The ruins of what must once have been a most beautiful and extensive abbey yet remain, though the walls, here as elsewhere, have been used as quarries; but the lady chapel at the west,

more often called St. Joseph's, still shows fine transitional work, and the great abbey church to the east Early English arches and windows. A dozen plates may be easily expended here; but churches, not ruined abbeys, are the subject of this article, and therefore Glastonbury Abbey must be quitted; but before the town is left the tower of St. John's Church should be photographed. It is not very well situated: the tower is high, the churchyard small; the only spot from which a view can be obtained is from the south-east, and a wide-angled lens and a swing-back will have to be employed to get in the top of the lofty tower. The other church, St. Benedict's, far inferior to St. Joseph's in size and interest, makes a very good picture from the street leading down to the station, taken from the west, and backed up by the Tor with the ruined tower upon its summit. A few miles by rail will bring the photographer to Wells, where good pictures, both exterior and interior, may be taken of the cathedral, which contains some of the most lovely Early English work to be met with in the west. But on the way into the town from the Great Western Station the church of St. Cuthbert is passed. The tower of this is one of the two finest in Somerset. It is of a different type from any hitherto described, and in it the horizontal lines, which detract so much from the beauty of Perpendicular towers, are less numerous and less marked. It will be noticed how often these horizontal lines or stages of the tower cut it up into a series of almost perfect cubes, destroying the appearance of height; but in St. Cuthbert's, as will be seen from the accompanying illustration, this is not the case, and the lofty belfry windows and four tall pinnacles at the corners give the idea of vast height. Four views may be taken—one from the street looking east, one from the south-east getting in the whole church, one from the south-west, and one from the north-west showing the tower and part only of the church. It will be noticed that the staircase does not run up the whole height of the tower, but ends about halfway up.

From Wells to Yatton the railway runs along what is called the Cheddar Valley, which skirts the Mendip Hills. At several

stations the photographer will find it worth his while to halt: at Cheddar for the church, the market cross, the splendid limestone cliffs; at Axbridge for the church close to the station, and at Banwell and Sandford stations, if he does not mind a walk of two miles, which will take him to Banwell village, where several good views of the church may be taken, including one looking across

ST. CUTHBERT'S, WELLS.

the pool or well from which the village derives its name. At Congresbury, the next station, again he must stop, for here is a fine church with, strange to say, a spire, of which several good pictures may be made, and a village cross. From Congresbury a walk of about three miles will bring the photographer face to face with the finest tower in all Somerset, that of Wrington, a tower that will hold its own against any church tower in England,—not indeed in height, for Boston stump rises to nearly twice the height,

and no doubt there are others that would overtop it, but in its simple beauty and the perfection of its proportions. It is a tower of the same type as that of St. Cuthbert's, Wells, and is even less divided by horizontal lines than that, for on the western and eastern faces there is but one, on the north and south there are only two such lines. The belfry windows are of great height, extending from near the ridge of the roof of the nave well nigh to the top of the tower, which, unlike that of St. Cuthbert's at Wells, has a pierced instead of a battlemented parapet, as may be noticed

ALL SAINTS', WRINGTON.

by examining the illustration. And how much more beautiful and appropriate is a pierced parapet! Battlements are right on the top of a castle, for there they are of use, but on a church they are out of place, save in those rare instances where church towers were built with a view to defence; but on the other hand the piercing of a parapet is of use, since, should the shoots get choked with leaves in autumn or with ice in winter, the openings through the parapet will allow the rain or melting snow to escape and run down the outside walls, where it will do far less harm than if it were retained to soak down through any cracks which may exist in the tower

roof into the interior. The pierced parapet along the walls of the nave and aisles is handsome, and the light pinnacles in which the buttresses terminate give grace and lightness to the building. There is at the eastern extremity of the roof of the nave a little turret, doubtless intended for the sacring-bell, which was used at the time of the "elevation of the host." From three points good views of the church may be obtained—from the south-east, and the north-east, within the churchyard, and from a field to the west; but from the two first positions the great height of the tower, about 150 feet, necessitates the use of a somewhat wide-angled lens. About three miles from Wrington is Yatton, another noble church with Perpendicular and Decorated work. Here again we meet with pierced parapets along the walls of nave and aisles and tower; from within the latter of which rises a truncated spire, which is more curious than beautiful, and without which the church would look all the better; were however the spire raised to the point to which its lines converge, it would be one of the loftiest of church spires in the country. The west front, the south porch, and the base of a churchyard cross of great size and height, are well worthy of notice. Several good pictures may be obtained from various points of view in the spacious churchyard.

After a railway journey of twelve miles by rail Bristol will be reached, with its cathedral, unique in many points, and the fine Norman archway of St. Augustine's Abbey gate; but still more worth a visit is it on account of St. Mary Redcliffe's church, one of the largest churches in England. Here will be found ample scope for photographing individual parts—the handsome south porch, the far more richly carved north porch, the spire, and the double-aisled transepts, to say nothing of the magnificent interior. One difficulty will probably be found; and that is, the smoke and mist which, whether the weather be wet or fine, seems to enwrap this part of Bristol. Three times have I been there, and each time my pictures, excepting those of details taken close at hand, have been more or less marred by the foggy atmosphere, even though outside Bristol the air was clear and bright.

Bath Abbey, too, is worth a visit, though probably the photographer's patience will be sorely tried by the almost incessant stream of passers-by, some on foot, others in those chairs that take their name from the place; moving some of them so slowly, too, that the device of using a slow plate and the smallest stop, which I have sometimes had recourse to with success, will scarce avail here. More promising subjects may be found in the remains of the Roman Baths hard by, recently thoroughly excavated and cleared of the modern buildings which occupied the site. If, when at Bristol, we have time, there is one church that we should visit, not on account of its beauty or architectural interest, but because of its association with the subject of what many, myself among the number, consider the finest poem that the nineteenth century has produced. Who knows not these lines?

"The Danube to the Severn gave
The darkened heart that beat no more;
They laid him by the pleasant shore,
And in the hearing of the wave."

And old Clevedon church is the spot thus hallowed. Here within the transept, on a tablet little in accord with the æsthetic taste of to-day, we may read the letters of the name and the number of the years of Arthur Hallam, the friend of Tennyson's youth. This is his "place of rest by that broad water of the west."

This article has now grown to ample length, yet without mentioning all the churches of Somerset that are worthy of a visit; but I think that something has been said of most of the finest, though there is a little group in the country round Evercreech. All these I have myself visited, and others also. One part of Somerset alone have I not yet explored: that which lies on the north-eastern slopes of the Quantocks and on the flats between them and the sea, and which may be visited by following the road from Bridgewater by Cannington and Nether Stowey to Williton; a road which runs through a district remote from railways, but interesting from its connection with Coleridge and Wordsworth. Enough, however, has been said to show that a photographer who is not afraid of a walk, of

at most some twelve miles a day, may in Somerset find a splendid field for architectural work. And if, when his negatives are developed and printed, the prints are arranged in what we may call topographical order, he will find that in many cases a group of churches in one district will bear a family likeness, as it were, to each other, due it may be in some instances to the imitation of some particular church when the others near it were built or altered, and in other instances no doubt to the fact that they were designed by the same architects.

T. Perkins.

THE PHOTOGRAPHIC WORK OF ROBERT HUNT.

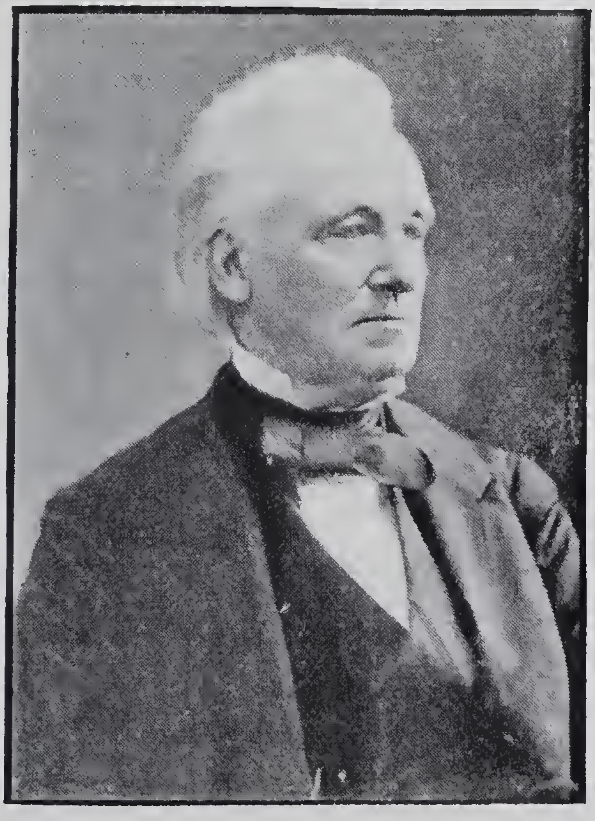
AMONG the early workers at photography the name of Robert Hunt will ever hold an honoured place. In presenting to the readers of the PHOTOGRAPHIC QUARTERLY a summary of the photographic work achieved by Hunt, it is not intended to enter into biographical details; still a few of the main facts connected with the life of this scientist are almost necessary.

Born at Plymouth Dock (now Devonport), September 4th, 1807, Hunt's career extended over the long period of eighty years. He died at Chelsea, October 17th, 1887. His first scientific contribution appears in the year 1838, on "Tritiodide of Mercury"; and perhaps what may be taken as his last photographic contribution will be found in the *Photographic Year Book* for 1882—"Photographic Researches before Daguerre." The first photographic treatise printed in this country, if we except the translation by Memes of Daguerre's work on "Daguerreotype," was Hunt's "Popular Treatise of the Art of Photography" (Glasgow, 1841). This work was so successful that no less than six editions were issued. Another equally successful work was the "Manual of Photography," published originally as a volume in the *Encyclopædia Metropolitana.* This was the recognised text-book on photography of its day, passing likewise through several editions. In 1840 Hunt was appointed Secretary of the Royal Cornwall Polytechnic Society; and it was at Falmouth, where he had gone to reside, that he compiled his well-known work "Researches on Light," the first edition of which appeared in 1844. The complete title of the work—a somewhat long one—was as follows:—"Researches on Light: an Examination of all the Phenomena connected with the Chemical and Molecular Changes produced by

the Influence of the Solar Rays, embracing all the known Photographic Processes and New Discoveries in the Art." A second edition was published in 1854, and had a somewhat amended title: "Researches in Light in its Chemical Relations, embracing a Consideration of all the Photographic Processes." This may be considered Hunt's *magnum opus*, as far as photography is concerned. The second edition is a volume containing more than double the amount of matter found in the first, and embodies many interesting and original experiments made by the author himself. A subsequent edition was published by H. Bohn in 1862.

During his tenure of the office of Secretary to the Royal Cornwall Polytechnic Society, a period which extended to about five years, Hunt was not only actively pursuing those photographic researches with which his name has been identified, but his attention was turned to a study of the geological and mineralogical phenomena presented by the rich mineral deposits which are found in such profusion in the county of Cornwall. Hunt's work in this direction was the means of securing for him a Government appointment—viz., the Keeper of the Mining Records. This was in 1845, and in 1851 he was made Lecturer on Mechanical Science in the Royal School of Mines. It would appear that he only held the latter appointment for two years, the work of the Mining Record Office being such as to engross the whole of his time and attention. Hunt was Keeper of the Mining Records for the long period of thirty-seven years. From the foregoing it will be seen that Hunt's photographic work was prosecuted in the earlier years of his life. Photography was his first love; but the multifarious duties of a Government appointment, connected as it was with a science differing so widely in character from that of photography, had the effect of turning his thoughts into a different channel altogether. Before considering in detail and in their chronological order the various photographic contributions published by Hunt, a short reference to some of his scientific works other than those belonging strictly to the science of photography may be here appropriately made.

Hunt was not only a scientific man, but he was something more. He was a literary scientific writer, and his writings are by no means confined to any one subject. So early as 1829 we find a short poem entitled "The Mount's Bay, Penzance," emanating from his pen. In 1848 "The Poetry of Science; or, Studies of the Physical Phenomena of Nature," made its appearance, to be followed by a second edition in 1849. This year saw



also the publication of "Panthea; or, The Spirit of Nature," in which, as the author puts it, "an attempt has been made to exhibit the progress of a young and ardent mind, captivated by the beautiful in Nature and allured by the wonders of science, under the influence of the conflicting views which beset our philosophy." Then again, in 1865, Hunt gives to the world "Popular Romances of the West of England; or, The Drolls, Traditions, and Superstitions of Old Cornwall." This work was in two volumes, and was illustrated by George Cruikshank. A new edition of it has

just been issued. In 1851 Hunt was connected with the scientific work of the first Exhibition, and drew up, in connection therewith, "The Synopsis" and "Handbook." "Elementary Physics" appeared the same year, as also a "History and Statistics of Gold." For the Exhibition of 1862 Hunt also furnished a handbook; and so recently as 1884, the year of the Health Exhibition, he rendered similar services.

Hunt likewise edited three editions of the well-known work "Ure's Dictionary of Arts, Manufactures, and Mines"—viz., those which appeared in the years 1860, 1867, and 1875. The blue book, "Mineral Statistics of the United Kingdom," which appeared annually from 1855 to 1884, was edited under Hunt's supervision. This work is still being carried on; but his last work in this direction, "British Mining," which appeared in 1884, is, perhaps, the most important. In 1854 Hunt was elected a Fellow of the Royal Society.

Hunt's first scientific contribution to the *Philosophical Magazine* was in 1838; and, although not strictly bearing on the science of photography, it may be here recorded. He details a mode of preparing tritiodide of mercury, and notes some of its properties. The article is to be found in the *Philosophical Magazine* for January 1838, vol. xii., p. 27.

In the *Philosophical Magazine* (London and Edinburgh), vol. xvi. (February 1840), p. 138, will be found an article by Hunt "On the Permeability of Various Bodies to the Chemical Rays." The opening sentence is significant: "Having many years since repeated, with much interest, the experiments of Wedgwood, Davy, and Wollaston on the chemical influence of light, it was with much pleasure that I read Mr. Talbot's paper on 'Photographic Drawing,' which opened to me new views, and pointed out paths rich in the promise of important results." The experiments detailed are an attempt to obtain a measure of the interference of various bodies placed in the path of a strongly illuminated pencil of light. A U tube holding in one arm a solution of nitrate of silver, in the other one of potassium iodide; the whole was screened

from light, save where the fluids met, by means of platinum wires; each side was coupled up with a sensitive galvanometer, and the force of electro-chemical action being dependent on the quantity of light falling on the exposed portion, Hunt naturally thought that the deflections of the needle would furnish comparative results when the various bodies were interposed in the path of the incidental light. The variations of sunlight were so great that Hunt subsequently adopted a method whereby (having in the first instance by the galvanometer ascertained that the various bodies approached each other in their power of interference) he tested several bodies at one and the same time. This he did by placing them in regular order upon a sheet of highly sensitised paper in a dark room, and exposing them for a definite period to light. The degree of darkening of the paper for each substance was then noted, and comparison made with the results obtained by the galvanometric method. A table is appended of the results thus obtained. The paper was prepared by being washed (*sic*) with a solution of barium chloride and nitrate of silver.

In the same volume of the *Philosophical Magazine*, vol. xvi. (June 1840), p. 267, another memoir of Hunt's is published—"Experiments and Observations on Light which has permeated Coloured Media, and on the Chemical Action of the Solar Spectrum." Dwelling on the fact that Herschel had produced a coloured picture of the spectrum, and that analogous results had been obtained by himself, Hunt was induced to commence a series of experiments to see whether coloured photographs could not by some means be arrived at. He found that the various chlorides, in their combination with silver nitrate, forming silver chloride, gave characteristic results. These have been tabulated by Hunt, and the effect of light passed through variously coloured glass is duly noted. The same contribution contains a series of experiments devoted to the germination and growth of plants under coloured media.

In the number for September 1840, vol. xvii., of the *Philosophical Magazine*, Hunt contributes a memoir "On the Use of

Hydriodic Salts as Photographic Agents." This title will doubtless seem quaint to those accustomed to our modern nomenclature. "On the use of the iodides as photographic agents" would be the modern rendering of the title. The paper is a long one, the first part of which extends over some nine pages; while the continuation, published in the following month, occupies eight pages. One has to remember that we are dealing with the period previous to the development of silver iodide exposed to light. Experimentalists—Talbot and Herschel—had noticed that silver iodide darkened by exposure to light, and pictures of a kind had been obtained both in the camera and by contact printing, or, as Hunt renders it, by application. Hunt's endeavours are directed towards an explanation of the various phenomena presented, notably the fading of the "hydriodic photograph." It would extend this article to an undue length to enter upon all the points raised and discussed in this particular memoir, but the student who is interested in the photo-reactions of silver iodide will find here much that is original and well worthy of attentive perusal.

In 1841 the British Association had its meeting at Plymouth, and in the Chemical Section Hunt has a short communication (*British Association Reports*, 1841, part ii., p. 47), "On the Influence of the Ferrocyanate of Potash on the Iodide of Silver producing a Highly Sensitive Photographic Preparation." The author describes the action of the solar spectrum on such a preparation, and from the fact that a coloured impressed spectrum was secured argues out the possibility of eventually securing coloured photographs. The paper securing the impressions of the spectrum or of coloured media superimposed was exposed while wet, the coloured result fading out as the paper became dry. Ferrocyanate is the early term for ferrocyanide, and the salt employed as a sensitiser by Hunt is the yellow prussiate of potash, potassium ferrocyanide.

The following year, 1842, the British Association met at Cork and in the section devoted to Chemistry there are three contributions from Hunt: "On Chromatype, a New Photographic Process"; "On the Influence of Light on the Growth of Plants," and "On the

Influence of Light on a Great Variety of Metallic and Other Compounds" (*British Association Reports*, 1842, part ii., p. 35). A fourth paper was given in the Mathematics and Physics Section—"On the Changes which Bodies Undergo in the Dark" (*British Association Reports*, 1842, part ii., p. 10). Chromatype printing consisted in "washing" paper over with a solution of sulphate of copper, and afterwards with one of bichromate of potash, exposing to light behind an engraving, and developing with a solution of silver nitrate. The paper "On the Changes which Bodies Undergo in the Dark" is in reality an abstract of an important memoir contributed to the *Philosophical Magazine* of the same year "On Thermography; or, The Art of Copying Engravings or any Printed Characters from Paper on Metal Plates; and on the Recent Discovery of Moser, relative to the Formation of Images in the Dark." What thermography is may be briefly stated. A silver or gold coin, placed on a well-polished copper plate and slightly warmed, will when cold and on exposure to fumes to mercury develop out an image of the superimposed coin. Hunt endeavours in his memoir to account for this, and similar phenomena, and he gives a series of independent experiments in addition to those of Moser. Woodcuts, line engravings, etc., were copied by being placed in contact with a metal plate and left for some little time. The details by which this was accomplished are too minute and lengthy to admit of their being given here. Hunt evidently expected that practical results would ultimately follow from the observed phenomena, but the subject has been allowed to remain very much where Hunt left it. Is there no experimentalist to be found able and willing to make further investigations on the lines laid down in the memoir here referred to? The original contribution is in the *Philosophical Magazine*, 1842, vol. xxi., p. 462. In the several editions of Hunt's "Researches on Light," Thermography forms one of the many chapters into which the work has been divided. It remains to be noted that Professor Moser did not apparently appreciate Hunt's independent investigations. Moser's strictures appeared in *Poggendorff's Annalen*, vol. lix., part i., and were translated

in the *Philosophical Magazine*, 1843, vol. xxiii., p. 356. Hunt's dispassionate reply will be found in the same volume (p. 415). The following pregnant sentence may be quoted: "I have ever pursued my inquiries with, I hope, but one object in view. The investigation of curious phenomena has ever been a pleasure to me, and an occasional discovery has been its own exceeding great reward. I never expected to be charged with repeating the experiments of others, and giving them out as my own discovery." Some ten pages are devoted to Hunt's reply.

Hunt having received a grant from the British Association in 1843, to continue his "Researches on the Influence of Light on the Germination of Seeds and Growth of Plants," accordingly presented his report at the meeting held at York in 1844. This was printed *in extenso* (*British Association Reports*, 1844, part i., p. 29). In the Chemical Section two contributions were furnished by Hunt—"On the Influence of Light on Chemical Compounds and Electro-chemical Action," and "On the Ferrotype, and the Property of Sulphate of Iron in developing Photographic Images" (*British Association Reports*, 1844, part ii., p. 36). This last contribution, short and brief as it stands, must have its value judged from another standpoint than that of length. The dormant photographic image, whether obtained by means of the camera or by contact, was found by Hunt amenable to the action of a solution of ferrous sulphate. Not only, as Hunt showed at the time, were the organic salts of silver capable of being developed by this reagent, but camera pictures could be obtained in less than a minute when paper coated with silver iodide was employed, and after exposure submitted to the action of the iron solution. The importance of Hunt's discovery became much more apparent a few years later, when the collodion process came before the world. All this is now a matter of history. Suffice it to say, had Hunt rendered no other service to photography, this of itself, so far-reaching in its results has the discovery been, would have earned for him the highest possible recognition.

In vol. v. of the *Chemist*, Hunt contributes an article "Energiatype," a new photographic process. This is, to all intents and purposes, a process based on the principles of the ferrotype. A succinate of silver is here employed, obtained by first coating the surface of paper with a solution succinic acid (5 grains) dissolved in one ounce of water, and afterwards drawn over the surface of a solution silver nitrate (60 grains to ounce). It is noteworthy that the restrainer used along with the sulphate of iron solution was a solution of gum arabic. Hunt points out how the solution of iron can be kept from oxidising by the addition of a few drops of sulphuric acid.

In the *Philosophical Magazine*, vol. xxiv., 1844, p. 435, Hunt describes chromo-cyanotype, a photographic process founded on the light reactions taking place, when a mixture of solutions of potassium bichromate and potassium ferrocyanide is made use of. At the Cambridge meeting of the British Association, in 1845, presided over by Sir John Herschel, we find Hunt presenting a report on the actinograph, an instrument designed to record daily the amount of solar chemical energy, as shown by the darkening of a paper coated with silver bromide (*British Association Reports*, 1845, p. 90, part i. As far back as 1838, Sir John Herschel had devised such an instrument, and it was his form of apparatus Hunt made use of. The actinograph did not quite fulfil the purposes for which it had been originated. In the *British Association Reports*, 1846, p. 31, part i., Hunt has another report to make regarding a year's results. It may be here stated that Hunt found the silver bromide to be too sensitive for use in the bright days of summer; consequently this salt was abandoned, and ammonia-nitrate of silver used instead. Even with this the variations of colour produced, according to the time of day and other factors, prevented a proper estimate of the actual amount of darkening being arrived at. At the Cambridge meeting, Hunt presented to the Chemical Section a paper, entitled "Contributions to Actino Chemistry—On the Chemical Changes produced on the Solar Rays, and the Influence of Actinism in Disturbing Electrical Forces"

(*British Association Reports*, 1845, p. 29, part ii.). It is only a very short abstract which is given, but the point brought out by the various experiments was to the effect that weak electrical currents sufficient to precipitate the metals from solutions in the dark were not capable of doing so when exposed to sunshine or even diffused light.

In addition to the report on the actinograph, in 1846, Hunt furnishes another—"Notices on the Influence of Light on the Growth of Plants" (*British Association Reports*, 1846, p. 33, part i.). These investigations of Hunt's in connection with plant life had a practical result in the nature of the glass that was used for glazing the Palm House in Kew Gardens. A report "On the Coloured Glass employed in Glazing the New Palm House in the Royal Botanic Gardens, at Kew," will be found in the *British Association Reports*, 1847, part ii., p. 51. In the appendix to "Researches on Light" (second edition), several letters from Hunt addressed to the authorities, and giving his reasons for adopting the coloured glass in question, have been printed.

"Report of Progress in the Investigation of the Action of Carbonic Acid on the Growth of Plants allied to those of the Coal Formation," is the title of a short report made by Hunt to the British Association meeting of 1848 (*British Association Reports*, 1848, p. 84, part i.).

In part ii., p. 54, of the *reports* for same year, a short abstract of a paper read to the Chemical Section, "On the Influence of Light in Preventing Chemical Action," is given.

The British Association, in 1850, had their rendezvous in Edinburgh, and at this meeting Hunt contributed a very valuable report, extending over some twenty pages—"On the Present State of our Knowledge of the Chemical Action of the Solar Radiations" (*British Association Reports*, 1850, p. 137, part i.). This is a most important contribution, epitomising the various light reactions noted from the earliest times down to the year in which the report was presented. A list of the bodies which had been found susceptible of chemical change under the influence of light, with the date of

observation and name of observer, was also furnished. This table has been recognised as the most complete thing of the kind, and to photographic literature has been of the greatest service.

In 1852 Hunt presents a report to the British Association "On the Chemical Action of the Solar Radiations" (*British Association Reports*, 1852, p. 262, part i.). The investigation Hunt here carries out is an examination of the prismatic spectrum by coloured glasses. To a certain extent these experiments were instructive, but we have always to remember that the spectrum employed by Hunt was a very impure one.

In the following year, 1853, a continuation of these experiments is given (*British Association Reports*, 1853, p. 68, part i.). These and the foregoing, however, are too extended to refer to in this communication. Apart from the original memoirs, the greater portion of the work done at this particular period will be found in the "Researches on Light" (second edition), under chap. xi.—"Analysis of the Spectrum by Absorbent Media."

Hunt does not seem to have contributed any further reports or memoirs to the British Association. When the Photographic Society of London was founded, in 1853, we find Hunt seconding the motion, moved by Sir William J. Newton, "That a society be now established to be called the Photographic Society." He was an original member of council, and at the second meeting of the Society, held March 3rd, 1853, read a paper "On the Principles upon which the Construction of Photographic Lenses should be Regulated" (*Journal Photographic Society*, vol. i., p. 14). At the fifth meeting, held June 2nd, 1853, another paper was furnished by Hunt—"On Methods for Measuring the Variations in the Chemical Action of the Solar Rays" (*Journal Photographic Society*, vol. i., p. 81); in this he returns to the actinograph and his former experiments. The apparatus is represented by diagrams accompanying the letterpress.

ANDREW LANG.

WARM TONES ON BROMIDE PAPER.

IT seems almost unnecessary to give any preambulatory notes as to the cause for the desire for warm tones on bromide paper. The Eastman Company first suggested, I believe, the application of uranium to the finished print on their transferrotype paper, to give a warmth and colour which could not be obtained by ordinary development, but they pointed out that it was essentially a process of intensification; and one cannot help feeling very strongly that it is so, and it has a tendency to strengthen up the distance so as to destroy to some extent the atmospheric effect.

In Anthony's *International Annual*, 1889, page 266, I stated that experiments had been commenced which would enable any one to obtain warm tones even to purple shades on bromide prints; and in the succeeding volume, 1890, page 340, I suggested bleaching the image with a chlorising agent and then reducing with sulphantimonite of soda or a weak developer.

Senier recommended the chlorising of the image and redevelopment, and A. R. Dresser suggested bleaching with mercury and redevelopment with quinol.

In his excellent book—"Leitfaden für den Positiv-Entwicklungsprocess auf Gelatine-Emulsions-Paper, etc."—Dr. E. A. Just suggests the use of the alkaline developers for obtaining warm tones; and Dr. Stolze ("Photo-Nachrichten," 1891, p. 4) gives a summary of his experiments to obtain warm tones by various developers, and finally suggests giving a long exposure, and developing with the following:—

A.

Sodium sulphite . .	20 parts.
Eikonogen . . .	4 ,,
Water . .	300 ,,

B.

Potash carbonate . .	50 parts.
Water	300 ,,

To obtain brownish tones, the actual developer must be com pounded as follows :—

Solution A	50 parts.
„ B	20 „
Water	150-180 „

To every 100 parts of this add—

Solution of bromide of potash (1 : 10)	5 to 10 „

Brown or blackish brown tones only are to be thus obtained. Dr. Stolze also suggests bleaching the image with a solution of bromide of copper, stating that this is preferable to chlorising the image, as stains are less likely to appear. The bromide of copper solution can be made by dissolving :—

A.

	Copper sulphate	1 part.
in—		
	Distilled water	100 parts.

B

	Potassium bromide	1 part.
in—		
	Distilled water	100 parts.

and mixing the two solutions; the thus bromised image should be well washed and then exposed to daylight and redeveloped with the above eikonogen developer mixed in the following proportions :—

Solution A	50 parts.
„ B	20 „
Water	5000 „

The second reduction takes place very slowly, and the image becomes first red, then reddish brown, black red, and finally violet black. When any desired tone is attained, the print should be immersed in a solution of citric or tartaric acid or a solution of sulphite of soda acidulated with one of the above acids. Fixing is not necessary, and the image is said to be permanent.

Werge ("Year-Book of Photography," 1891, p. 86) suggests the use of a weak quinol developer with about five times the ordinary exposure, when reddish or warm brown tones are obtained. Clement J. Leaper suggests the use of a chlorising agent and re-development under an acidified ferrous sulphate solution in day-light. It is of course possible to obtain modifications of tone by using chloro-platinic acid, or a strong sulphocyanide gold bath made alkaline with caustic potash, or by the use of a mixture of iodide of potassium and chloride of gold as suggested by H. H. Roden. To these methods I shall not do more than refer, merely remarking that so far I have obtained the best results by using the sulphocyanide alkaline gold bath after fixing and well washing.

To Mr. J. Weir Brown we are certainly indebted for directing so much attention to the use of uranium ferridcyanide, and his experiments have tended most decidedly to the improvement of bromide prints and enlargements so far as regards warmth of tone. Mr. Weir Brown's developer is compounded as follows :—

SOLUTION A.

Quinol	720 grs.
Potassium bromide	135 ,,
Sodium sulphite	9 ozs.
Water to	90 ,,

SOLUTION B.

Sodium carbonate	$13\frac{1}{2}$ ozs.
Potassium carbonate	$13\frac{1}{2}$,,
Water to	90 ,,

For use mix in equal parts and add from 1 to $1\frac{1}{2}$ oz. of water. After development, fixing and washing, the following toning bath is used :—

Uranium nitrate	20 grs.
Potassium ferridcyanide	20 ,,
Distilled water to	20 ozs.
Acetic acid	1 oz.

When toned the prints should be well washed, and preferably in slightly acidified water, as alkalies dissolve uranium tone. It is

questionable whether these prints are permanent ; some at least contend that they are not, but Mr. Weir Brown contends that they are, or at any rate for some considerable time. It may be interesting to note with regard to this subject that I have some transferrotype prints thus treated in 1889 which although hung in an ordinary room show no change at present.

Starting with the presumption that it is desirable to obtain various toned prints by the aid of bromide paper—although it has been contended, and justly so I think, that there are other papers more suitable for this purpose—I propose now to suggest some chemical experiments which may give us still further command over this process of toning, if toning it can be called, though actually it is an intensification process.

The bromide print may be developed with ferrous oxalate, quinol or eikonogen, but in no case must full vigour be obtained ; in fact, the finest results are to be obtained by over-exposure and thin images obtained with eikonogen ; after fixing and well washing immerse the print in the well-known lead intensifier of Eder and Toth, which is composed of—

Nitrate of lead	4 parts.
Ferridcyanide of potassium	6 ,,
Distilled water	100 ,,

Filter.

The image becomes white from formation of the ferrocyanides of silver and lead, and this enables us to obtain almost any colour we like ; and for convenience I now tabulate the tones and the necessary solutions.

Black, by using—

Ammonium sulph-hydrate	1 part.
Distilled water	3 parts.

Brown, by using—

Schlippe's salt	10 parts.
Ammonia	5 ,,
Water	150 ,,

Reddish yellow, by using—

Potassium bichromate	1 part.
Ammonia	1 "
Water	10 parts.

Yellow, by using—

Neutral chromate of potash	1 part.
Water	10 parts.

Green, by treating the yellow image with—

Ferric chloride	1 part.
Water	10 parts.

Brown, by treating the yellow image with—

Manganate of potash	1 part.
Water	10 parts.

Copper red (Bartolozzi ?), by treating the yellow image with—

Cupric chloride	1 part.
Water	10 parts.

Red brown, by treating the image with—

Nitrate of uranium	1 part.
Ammonium chloride	1 "
Water	10 parts.

Deep yellow, by treating the yellow image with—

Iodide of potassium	1 part.
Water	10 parts.

Reddish brown, by treating the white image with—

Copper sulphate	1 part.
Water	10 parts.

Green or reddish grey, by treating the white image with—

Cobalt chloride or sulphate	1 part.
Water	10 parts.

This image is first greenish and then gradually turns reddish grey.

Green, by treating the white image with—

Nickel chloride or sulphate	1 part.
Water	10 parts.

Orange yellow, by treating the white image with—

Mercuric chloride	30 parts.
Potassium iodide	45 ,,
Water	100 ,,

It is certainly not necessary for me to indicate the chemical decompositions which occur, but I may point out that the image in each case is formed by simple well-known laws of chemical decomposition, and one can at once determine the probable permanence or not of the tone obtained.

E. J. Wall.

NOTES.

THE illustration which forms the frontispiece of the present number is a Woodburygravure print from a negative by Mr. John Hodges, and it is just one of those studies of still life which even the most exacting critic of photographic art methods must admit is eminently suitable for reproduction by the camera. It represents the old wheel of Dunster Mill, and Mr. Hodges sends us the following particulars. It was taken upon a "Castle" plate, with a French wide-angle rectilinear of $7\frac{1}{2}$-inch focus, working at *f*/16, upon a whole plate, and an exposure of 40 secs., in diffused light, was given. The negative was developed with plain pyro. and ammonia, and was found to be correctly exposed.

With regard to the Hon. J. G. P. Vereker's paper in our last, we have the following explanation to offer, furnished by Mr. Vereker :—

"Owing to an error of the mounter in the naming of the slide, the 'Navicula,' given in the article on Micro-photography, was called Navicula Rhomboides instead of Navicula Serians.

"The length of the diatom photographed is $\frac{1}{418}$ inch, and it has 48,430 dots to the inch ; it is therefore quite small and fine enough for the purpose for which it was reproduced, namely, to show what could be done with a Huyghenian ocular of short focus. On page 93 there is a clerical error in the power of the objective : the photograph was taken with a $\frac{1}{12}$-inch oil immersion of Reichert's, not with a $\frac{1}{2}$-inch.

"Although Navicula Rhomboides is known by name, it seems to be very uncertain and difficult to procure, or to obtain much information about. It is not one of the diatoms on Möller's test plate, nor is there even a picture of it in the 'Micrographic Dictionary'; the only good representation of it, that I am acquainted with, is a photograph just published by the London Photo-micrographic Company; it represents a portion of a valve of Navicula Rhomboides magnified 1,750 diameters; the markings on this valve are 62,000 to the inch. In appearance they are very similar to those on Navicula Serians.

"For information in English about Navicula Serians and Navicula Rhomboides, the student must refer to William Smith's 'Synopsis of British Diatomaceæ,' published between 1853 and 1856; this work contains drawings of both on a small scale. Mr. Smith gives the length of Navicula Rhomboides as $\frac{1}{360}$ inch with 85,000 striæ in the inch. The work is now very scarce, and one is only able to see a copy at the British Museum. The varieties of

diatoms are so numerous, and the information about them so scattered in scientific journals, that it is a difficult matter to name any special one; besides, new species are constantly being found. It is, however, not at all certain whether some of these varieties are not merely local modifications of the same diatom."

In a paper read, entitled "Some Recent Exhibitions," before the London and Provincial Photographic Association, Mr. P. H. Newman gave vent to some views which are well worth reading:—

> "Firstly, photographic exhibitions, if not unmixed blessings, as we partly suspect, are, in the present condition of the art, greater necessities than ever, especially so if the amateur is to be recognised: and as he or she, like another class, 'is always with us,' the amateur will be recognised. I think it is expedient also that he should be medalled, for, after all that can be urged, it has never seemed to me that the professional photographer has really much cause of objection to the amateur, because not only does he tend to popularise photography by his efforts, but his very failures increase the popularity and appreciation of really good photographs, and thus add to the chances of the professional, who, in the long run, and having the start of the amateur, must, in the nature of things, generally beat him badly. Morever, it is from the ranks of the amateurs—diligent, absorbed, and therefore most successful amateurs—that the ranks of the professionals are best filled. Now, granted that the necessity, and even virtues, of the amateur are recognised, it is desirable that by exhibitions, medals, and competitions, the amateur should gradually learn what he is made of, and how far he falls short of a high standard of excellence.
>
> "But here, I must admit, we are met by the great and principal difficulty; for while, on the one hand, it is obviously desirable to encourage the amateur by allowing him indulgence in the pardonable human weakness, a little vainglory, dear alike to himself and his appreciative relatives—no inconsiderable public, by the way—it is equally necessary not to give the false impressions of perfection in his performances that a too indiscriminate awarding of prizes and medals must foster. I have seen something too much of this last year, and must not neglect an opportunity of dwelling upon it. . . .
>
> "And now, before I conclude, I should like to say a word or two on the standpoint of criticism. I do not, myself, see the absolute necessity of judging every photograph that comes before one as one would judge a pictorial composition. There are, of course, those who set out to make pictorial compositions,—these should, and must, be judged by the severest tests; but there are many excellent photographs in all exhibitions which, if I may so speak, are absolutely innocent of any such idea or intention, photographs which pretend to be no other than more or less faithful memoranda of places and things. Modern criticism, I fear, is rather prone to scoff at these things, and

unadvisedly, for they have their value. I am not holding a brief now for the inartistic: I have no such idea. I think you know that, from what I have said here and elsewhere, I love and revere the artistic as I scorn and despise pot-shotting or those who would tell me that a photograph of nature must of necessity be a work of art; but I do say this, that a simple photograph that makes no pretension to being a work of art, should be judged on its own unpretending merits and standpoint; if it cannot be a thing of beauty, it may at least be a thing of use. There are heaps and heaps of studies that are of special value in this direction, not at all to be included in that incongruous and vague, if art-affecting term, 'bits,' in its generally accepted sense, but bits of utility that the painstaking amateur may make exceedingly useful to the artist."

Mr. Haddon has suggested the use of potassium ferridcyanide and ammonium sulphocyanide to remove the silver image in a uranium-toned bromide print in preference to Farmer's well-known ferridcyanide and hypo. mixture; and the Editor of *The British Journal of Photography* suggests the application of this new solution for reducing negatives, and says:—

"Mr. Haddon made several other suggestions of probably considerable value in connection with uranium toning, to which we may advert on a future occasion. For the present, however, we will content ourselves by pointing out the applicability of potassium ferridcyanide and ammonium sulphocyanide as a reducer for negatives as well as silver positives on paper. We have ourselves submitted it to practical tests, both with very dense negatives and over-developed bromide prints, with satisfactory results. The ferridcyanide is best employed in a weak solution of from five to ten grains to the ounce, the sulphocyanide being, of course, used in considerable excess. Apparently the mixed solution keeps well, although, of course, we have not been able to give it an extended trial; but in an acid state, its activity is much retarded, while, on the other hand, its tendency to stain is diminished. Used in a comparatively powerful state of concentration, we have observed that it is most energetic as a solvent of silver, and hence we repeat that a weak solution is best in use, otherwise the half-tones of the picture are placed in danger."

Certainly from our own trials this is worth experimenting with, and it seems to us to be a feasible plan of removing the well-known silver stains from negatives, if the plates are treated to a chrome alum bath first, well washed and allowed to dry, and then immersed without washing in the ferridcyanide and sulphocyanide mixture.

In a lecture on "Light Measurement" before the Lewisham High Road Camera Club, Professor Carlton J. Lambert, M.A., gave the following useful tables, compiled by Captain Abney, which show how rapidly the actinic value of sunlight falls off as the sun's altitude decreases:—

		Candles at 1 foot.	Actinic.
Sunlight—June, overhead—visual		5500	120,000
	30° altitude	4700	72,000
	20° ”	3300	42,000
	10° ”	2000	9,000
	Before sunset	140	1·7

Professor Lambert tested the tables on February 18, 1892, when the sun's altitude was 20°, and found the visual effect equalled 2700 candles at one foot. The following is another table by Abney, of actinic values :—

1 visual candle of sunlight	= 20	ordinary candles.	
” ” electric arc	= 10·7	”	”
” ” magnesium	= 2·5	”	”
” ” limelight	= 2	”	”

Professor Lambert found that 20-candle-power gaslight gave a print on albumen paper in 27 hours. Captain Abney found a trace of a print on platinum paper in 20 hours. When there is a very bright moonlight night, people are apt to say that it is almost as bright as day. To show how ridiculous that is, Professor Lambert found that full moonlight in February = 1 candle at 10 feet, and that full sunlight in June = 550,000 such moons, which would cover the whole vault of the sky five times over. By means of photometers he compared different kinds of lights with a standard 16-candle-power Argand. Vulcan petroleum lamp = 30 candles (badly trimmed); limelight (blow-through jet) = 107 candles (gas was running short, or it would have been 150 to 200); Welsbach incandescent, with special mouth = 60; small incandescent electric lamp, lighted by 9 E.S. dry batteries = $1\frac{1}{4}$. He explained the method of comparing sunlight with standard candle by means of a rotating disc, with section cut out measuring $\frac{1}{54}$ part of sunlight ; this was compared with magnesium light directly, and the magnesium compared with a standard candle. It is worked out in the following manner : viz.,—$\frac{1}{54}$ sunlight = magnesium at 2 feet = 200 candles at 2 feet = 50 candles at 1 foot. ∵ sunlight = 54 × 50 2700 candles. This is how the result, stated as obtained on February 18, 1892, was arrived at. Abney's corresponding figures for same at 20° elevation were 3300. The following tables have been worked out by Professor Lambert, the cost of electric light being obtained at the Crystal Palace Electric Exhibition, so are right up to date :—

EFFICIENCY OF GAS-BURNERS.

	Candle Power. Standard Candles.	Consumption. Cubic ft. of Gas.	Efficiency. Candle Power per Cubic foot.
Common Bray, No. 2	3	3	1
” ” No. 5	9	6	1·5
” ” No. 7	14	7	2
Bray's Special Batswing, No. 9	20	8	2·5
London Argand	16	5	3·2
Albo carbon	20	3	6·6
Wenham	90	10	9
Welsbach	36	3	12
Gas engine, driving dynamo and 100 incandescent lamps	3200	400	8

Domestic Lighting.

Annual cost of maintaining a light of 48-candle-power, say, 2000 hours' burning. Results of tests under practical conditions :—

Gas.

Argand.—Three 16-candle lamps, consuming each 5 feet of gas per hour = 30,000 cubic feet of gas, at 3*s.* per 1000, 90*s.*; renewals of chimneys, 3*s.*—Total, 93*s.*

Wenham Regenerating.—One small Wenham lamp, consuming 6 feet per hour = 12,000 cubic feet of gas, 36*s.*; repair of lamps, etc., 5*s.*—Total, 41*s.*

Albo-carbon.—Two No. 2 Bray burners, consuming each 3½ feet per hour, carburetted with naphthaline = 14,000 cubic feet of gas, 42*s.*; 52 pounds of naphthaline, at 3*d.*, 13*s.*—Total, 55*s.*

Welsbach Incandescent.—One new large mantle 48-candle-power, burning 3½ feet per hour = 7000 cubic feet of gas, 21*s.*; renewal of mantles, 3 at 2*s.* 6*d.*, 7*s.* 6*d.*; renewal of chimneys, 1*s.* 6*d.*—Total, 30*s.*

Petroleum.

Large Lamp.—One 48-candle Vulcan, burning 1 gallon in 28 hours = oil, at 7*d.* per gallon, 41*s.* 8*d.*; chimneys, wicks, etc., 2*s.* 4*d.*—Total, 44*s.*

Small Lamps.—Four 12-candle lamps, each burning 1 gallon in 84 hours = oil, 55*s.* 6*d.*; chimneys, etc., 2*s.* 6*d.*—Total, 58*s.*

Electric.

Incandescent.—Three 16-candle lamps, absorbing each 56 Watts = cost of current, at 8*d.* per Board of Trade unit (1000 Watt hours), 224*s.*; lamp renewals, 6 at 3*s.* 6*d.*, 21*s.*—Total, 245*s.*

Note.—The figures above apply to the use of the various illuminants under ordinary household conditions. Careful laboratory tests, of course, give better results.

Comparative Estimate of Cost of Lighting by Electricity and Gas.

Electricity.

Outlay on Plant.

	30 Lamps.	300 Lamps.
6-lbs. gas engine, 2 h.p. nominal, 4½ h.p. indicated	£85	£330
Dynamos—50 volts, 40 ampères	40	200
Lamps (16-candle), switches, etc.	20	100
Fitting	10	60
	£155	£600

Annual Expenditure.

Renewal of lamps, 30, at 3*s.* 6*d.*	£5	£50
Depreciation, 10 % on £130	13	55
Labour	20	30
Gas and oil for Engine, 3 h.p., 1500 hours, ¾ per h.p. per hour	14	120
Interest on plant, 4 % on £150	6	27
	£58	£282

(If using accumulators, add £100 to cost of plant).

Gas.

Gas consumption 288,000 cubic feet at 2*s.* 6*d.* per 1000, using good ordinary burners, averaging $2\frac{1}{2}$-candle-power per cubic foot	£36	£360
Depreciation, repairs, interest on cost of fittings	4	40
	£40	£400

Note.—If electricity is supplied from public mains, at 8*d.* per Board of Trade unit, the annual cost, including renewal of lamps, will be £89 and £890.

Of course, what cannot be reckoned in above figures is the improved health when electric light is used; besides, the furniture, etc., does not get spoilt as when using gas.

At the meeting of the Photographic Society of Vienna on November 3rd, we learn from the *Photographische Correspondenz*, examples of a new method of preparing decorated and decorative metallic surfaces were shown, and the method of their preparation described. Messrs. Brandweiner and Lautensall, of Vienna, are the inventors of this new application of photography, and the following is Dr. Eder's description of their preparation:—On a highly polished metal plate of copper or brass an image is obtained by any of the usual photographic processes—for instance, by direct printing with bitumen or by transfer. After any requisite retouching, the plate thus prepared is submitted to an etching process, which should be rather a roughening or matting of the plate than the production of a relief. The protecting film is removed, and a polished image is seen on a matt ground. Great care must be taken to make the polished and matt places as full of contrast as possible, as the resulting pictures gain considerably in beauty.

As is well known, an electrolytic deposit very exactly assumes the same character as the surface on which it is deposited. The metal plate is now treated with a preparation which does not alter the character of the surface in any way, and which does not present any obstacle to the electric current. A deposit of some metal is now electrically produced. When using the nobler metals, like gold and silver, only an extremely thin film is required, about $\frac{1}{1000}$ mm. (= $\frac{1}{24000}$ inch, Eng.), and the necessary strength obtained by a deposition of a cheaper metal, such as copper.

A sheet of paper, card, leather, linen, etc., is now made to adhere, and on drying the edges are filed off. If the insulation was perfect, the thin metal deposit can be very easily stripped from the plate, which is again ready for a duplication of the pictures.

Professor Meldola gave a powerful appeal in support of a Photographic Institute in an address read before the Photographic Society of Great Britain, of which we extract some parts:—

> "The danger ahead which threatens the true cause of technical education appears to me to be this: The resources of the country are being too much frittered away in the multiplication of machinery for imparting elementary instruction, and the higher specialisation, which

alone will save us in the end, is being crippled thereby. The elementary groundwork must be laid, and this work, as far as it is being done, cannot be done too well. But it is absurd to suppose that we shall recover our lost position in any branch of industry by scattering broadcast a knowledge of elementary science, and there leaving matters to stand. A technologist is nothing—at least, in any of the subjects with which I have had connection—unless he has the means of superadding more advanced specialisation to his general grounding. So far as the chemical industries of this country are concerned, a few highly-trained specialists are worth more than an entire army of elementary certificated teachers or prize-winners. We are expending so much energy over our foundations that there is but little left for raising the superstructure. We are arming our industrial fighters with weapons which are as popguns compared with the heavy ordnance of our competitors. Unless those who are responsible can be made to see that the elementary training in general principles is, in a large number of subjects, quite useless unless the higher specialisation is equally well catered for, we shall be no better off in these branches of technology than we were before. The elementary training bears to technology the same relationship that the tuning of the instruments does to the overture. There is a great deal of twanging and blowing going on all over the country, but, as yet, comparatively few indications of a finished performance. There is enough money in the hands of the County Councils at the present time to support technical institutes adapted to local requirements on a scale which would bear comparison with the polytechnics and technical high schools of the Continent. If each county, or group of counties, had its central technical institute, manned by competent specialists, then the elementary training might bear real fruit, and we should look forward with greater hope to the result of the campaign on which we have entered. It is not difficult to see how the fight will end if we persist in blazing away with this elementary small shot in response to the ponderous missiles of our industrial competitors."

Necessarily, every one wondered what was to be done, and what the author of this paper, whom we need not state is one of our foremost technologists, would suggest as the best thing to do. Here we have his plan:—

"The Photographic Institute, such as we desire, would be an establishment thoroughly equipped for the best practical instruction, well provided with appliances for carrying on research in every department of the subject, and having attached to it the most competent specialists in every branch. The staff need not be numerous at first; a chemist, an optician and physicist, an expert in photo-mechanical processes, and an artist, would represent the chief departments. Your committee or governing body would know the right men to select; if they cannot be found in this country you may have to go abroad for them. This course may appear ignominious, but if

it has to be adopted so much the better; it will bear practical witness to the necessity of having the means of raising such men in our own country. The ideal institute may be a slow growth, but every effort should be made to establish it. The Photographic Society has already taken the initiative by proposing an affiliation with kindred societies. This scheme should be energetically pushed forward, and every means adopted for urging the importance of the claims of photography to have a recognised technological centre. I venture to think that an impetus would be given to the movement if representatives of the Camera Club, the Photographic Convention of the United Kingdom, and of the numerous photographic societies of the metropolis were invited to another conference, such as was held last year, but with the special object of forming a joint committee, under whose authority a further appeal might be made for public and private support. If only a moderate sum could be raised at first, operations might be commenced. Surely the numerous firms which have come into existence through the general introduction of photographic processes, and the large body of wealthy amateurs who practise the art as a pastime, might be sufficiently interested in the movement to give it their support.

"It only remains now to bring these suggestions to a practical issue. We are such a very practical nation that unless something tangible is offered, the foundation of the Institute may be indefinitely delayed; as yet there is nothing of the kind in existence—there is no organised work being done that appeals directly to the patriotism and to the pockets of those to whom you may legitimately look for assistance. But elementary photography is being taught in connection with technical schools and classes all over the country. A good beginning might be made if under the auspices of the joint committee a few first-class specialists were enlisted and authorised to give short courses of demonstrations to those affiliated societies or in those centres which desired to receive such instruction. The local centres might fairly be asked to make the necessary arrangements and to bear the small expense of local organisation; the fund raised by the joint committee would be well spent at first in defraying the costs of a few special lecturers. You may have some difficulty in laying your hands on the right men for this work; I need hardly remind you that the whole success of this initial movement would depend upon your sending only the most highly qualified specialists. You must have men who can teach the teachers and convince practical photographers that underlying the practice of their art are broad scientific principles which it is their interest to know something about. These preliminary peripatetic courses must be regarded in the light of missionary efforts, having for their object not the multiplication of photographic operators, but the awakening of the elementary and advanced student to the higher aspects of their subject. It is desirable to have this function of the lecturers well understood at the outset; the experts who are entrusted

with this work will know well enough that it is impossible to make a technologist out of a student, however enthusiastic he may be in his subject, simply by giving him a course of lectures.

"If the system of itinerant instruction which I have suggested can only be fairly started, even on a small scale, one important function of the Institute will have been inaugurated. It will have a claim upon the practical educationalist as a teaching body; it will appeal more specifically to the promoters of technical education, and to those public bodies which have voluntarily or by Act of Parliament identified themselves with this movement. It is certainly discouraging—I may say discreditable—when we see the magnificent scale on which the photo-technical Institutes of Berlin and Vienna have been founded and equipped, that in this country, whatever the importance of the subject, public recognition and support come only after success has been achieved by private enterprise. I am afraid you will have to reckon with this national characteristic, which, although retarding advancement in many directions, is so far good that it calls forth the most strenuous exertions to ensure success at the outset of every new movement. Upon the success of your first small undertaking will depend the larger ultimate success which we all look for.

"One other suggestion occurs to me which may help to strengthen your hands. I have said that instruction in photography is already being given in many technical schools; this instruction is more or less of an elementary character. It seems feasible to combine with the proposed courses of special lectures a system of inspectorship which might be carried out by the same staff. Your lecturers would be recognised experts, capable of advising such schools as to methods of teaching and co-operating with local centres in the selection of the most highly qualified teachers. I am sure that most centres would be only too glad to avail themselves of the knowledge and experience thus placed at their service. If you begin operations on these lines at first—if you can carry on this combined system of skilled teaching and inspection successfully for a few years, your claim for permanent establishment and endowment as a Photographic Institute cannot but receive that support from public bodies to which your educational efforts will have entitled you, and which in other countries is given by the State."

Dr. Wolf, of Heidelberg, has discovered two minor planets by means of photographic plates taken on December 22nd and 23rd. One of these is new (No. 323), but the other is probably identical with Sapientia (No. 275), which has only once been observed, in opposition. Since Dr. Wolf's discovery the two planets have been watched by Dr. Palisa at Vienna. The art of stellar photography has made rapid strides of late years, and has now become a powerful instrument in astronomical research. It has been expected that new planets would be discovered by this means, since, if two photographs of the same region of the heavens be taken at different times, upon comparison,

a planetary body will betray itself by its movement with regard to the fixed stars in the interval, or, if a single plate be exposed long enough, the planet will, by its movement, trace a "trail" upon the plate, whereas the images of the stars will be dots, the telescope being driven by clockwork so as to keep them always in its field as they apparently revolve around the earth in consequence of the diurnal motion. The mean places for 1891 of the two planets found by Dr. Wolf are (1) 6 h. 38 min. 42·28 s. + 24° 47′ 0·3″, and (2) 6 h. 49 m. 30·64 s. + 18° 37′ 5·33″.

Herr Valenta, in a recent number of the *Photographische Correspondenz*, gives the following simplified method of preparing light-sensitive sulphurised asphalt or bitumen:—100 grammes of raw Syrian asphalt are to be boiled with an equal quantity of commercial pseudo-cymene in which 12 grammes of sulphur flowers have been dissolved. When, after about three or four hours, the formation of sulphuretted hydrogen has ceased, the cymene is distilled off, and the product is the light-sensitive asphalt from which the film is prepared in the usual way by solution in benzol. The new preparation is soluble in benzol, toluol, cymene, xylol, and turpentine; it is said to be even more sensitive than that prepared by Valenta's other method.

Whilst going to press the following is the programme announced of the Camera Club Conference held annually in the Society of Arts Rooms:—

"Tuesday, March 22nd. Conference at the Society of Arts, 18, John Street, Adelphi, to be opened by the President at 3 p.m. Papers to be read from 3 p.m. to 6 p.m. in the Theatre.

"3 p.m. Opening by the President.

"Mr. C. H. Bothamley: 'Some Points in Connection with Development.'

"About 3.45 p.m. Mr. Leon Warnerke: 'On Chemigraphic Etching.'

"About 4.30 p.m. Mr. A. Pringle: 'Photography Applied to Medical Research.'

"About 5.15 p.m. Mr. W. Willis: 'Recent Improvements in Platinotype.'

"Renewal of Conference at 8 p.m.

"8 p.m. 'Symposium on Artificial Lighting in Photography.' Mr. Van der Weyde: 'Demonstration of Use of Electric Light for Portrait Effects.' Mr. E. J. Humphery: 'Oxy-magnesium Lamps for Printing and Lighting.'

"9.15 p.m. Mr. H. E. Armstrong, F.R.S.: 'Theory of Development.'

"Wednesday, March 23rd, 3 p.m. Renewal of Conference in the Theatre, Society of Arts. Papers to be read from 3 p.m. to 6 p.m.

"3 p.m. Mr. Henry Blackburn, Editor of *Academy Notes*: 'The Debt of Art to Photography.'

"About 3.45 p.m. Mr. H. Stanus, F.R.I.B.A.: 'The Uses of Photography to the Decorative Artist.'

"About 4.30 p.m. Mr. H. P. Robinson: 'Paradoxes of Art, Science, and Photography.'

"About 5.15 p.m. Captain Abney: 'Some Uses of Celluloid Films.'

"7.30 p.m. Annual Club dinner for members and friends at the Monico Restaurant.

"Thursday, March 24th, 8 p.m. Exhibition of lantern slides in the Theatre. Special tickets for this exhibition.

"The annual exhibition of photographs by members will be on view at the Club, Charing Cross Road, from 10 a.m. to 4 p.m. Admission by card from any member of the Club, or by ticket from the Hon. Secretary. The exhibition will be open under these conditions for about six weeks from Tuesday, March 22nd.

"All photographers are cordially invited to take part in the Conference.

'The meetings at the Society of Arts are open to ladies."

At a general meeting of the Photographic Society of Great Britain, Mr. James Glaisher, F.R.S., resigned the Presidency, and Captain Abney was elected in his stead, but only accepted the post by persuasion of the retiring President. It is interesting to note that out of a muster roll of 433 members only 144 took the trouble to vote on the election of the Council, and the following is the newly-elected Council for the ensuing year:—President, Capt. W. de W. Abney, C.B., D.C.L., F.R.S.; Vice-Presidents, T. Sebastian Davis, F.C.S., James Glaisher, F.R.S., F.R.A.S., John Spiller, F.C.S., F.I.C., and Sir H. T. Wood, M.A.; Hon. Treasurer, G. Scamell; Council, W. Ackland, G. L. Addenbrooke, W. Bedford, W. S. Bird, A. Cowan, T. R. Dallmeyer, W. E. Debenham, W. England, J. Gale, F. Hollyer, F. Ince, Dr. G. L. Johnson, H. Chapman Jones, F.I.C., F.C.S., A. Mackie, Capt. A. M. Mantell, R.E., A. Pringle, J. W. Swan, M.A., F.I.C., F.C.S., Professor J. M. Thomson, F.I.C., F.C.S., J. Traill Taylor, and L. Warnerke. It will be noted that Mr. W. S. Bird retires from the Treasurership.

Captain Abney, in a leading article in *Photography*, writing of electricity and light, says:—

"Some simple experiments which the writer carried out are worth repeating by those who are anxious to study the interdependence of chemical and electrical action. Plates of platinum of such purity as is to be found in commerce may be obtained of about four inches long by two inches broad, and platinum wires, some few inches long, may be fastened to these from the centre of one end. One or both of these plates may be coated with collodio-chloride emulsion, and the uncoated sides be placed parallel to one another with a piece of flannel between them, or be separated by three strips of glass, and then immersed in an alkaline solution, or water faintly acid with sulphuric acid, in a glass cell, which for convenience should have parallel sides. The wires should lead to a reflecting galvanometer of medium resistance.

If, now, the light from a piece of magnesium wire be allowed to fall on one of the coated sides of the plate, the spot of light which is reflected from the mirror attached to the needle of the galvanometer will travel off the scale. That this action is due to the chemical action on the surface of the plate, and not to the heating of the plate, can be tested readily. If a piece of blue glass, which absorbs most of the red and ultra-red rays of the spectrum, be interposed, but very little difference in the amount of the swing of the needle will be detected; but if a piece of orange glass be interposed, the needle will become practically quiescent. Now, the orange glass is what is called athermic—that is, allows the rays which have the principal heating effect to pass. Hence this simple experiment shows that it is the blue part of the spectrum which is the proximate cause of the electrical current. As photographers also know that it is these rays which give the photographic image, the conclusion is forced on one as probable that the current is caused by the decomposition of the silver chloride. Becquerel gave a diagram of the effect of the spectrum on silver chloride as derived from the electrical current generated by the impact of its different parts, and it coincides very closely with that which is obtained by observations made by photographic means. Now, if the chloride be really darkened, and then a very strong red light be allowed to fall on the surface, it will be found that the needle is deflected slightly in the opposite direction—at least, so the writer found—indicating that if the current is what may be called in one case positive, in the other it is negative. This would indicate that the effect of the red light on the darkened surface is different to that of the blue light on the undarkened surface; and this we have good evidence is the case in photography, where red light can cause a destruction or incapacity for development of the photographic image."

The following is the latest advance in *photography in natural colours*, patented by Dr. Raphael Kopp, of Lucerne, Switzerland, who has just died:—

"M. Kopp's process, as described in his specification, includes the preparation of the subchloride paper to which we have made reference. He salts Rives paper by floating for two minutes on a 10 per cent. solution of chloride of soda, followed, when dry, by treatment for a similar period on an 8 per cent. solution of nitrate of silver. The paper, upon being removed, is again transferred to the first bath for a short time. It is then washed by being placed in water for twelve hours, when it is treated by immersion in a bath of—

Chloride of zinc	0·15 gramme.
Sulphuric acid	2 drops.
Water	150·00 grammes.

"The paper, which must have been the layer or coating prepared as described up to now at the top, is placed in this bath, so as to be

exposed to the light, but not directly to the sun, for it is necessary that the light should be diffused. The exposure lasts until the layer or coating has obtained a greenish-blue tint. The paper must not be exposed longer to the light, as the colour would easily become too dark. Thus prepared, and well washed and dried between blotting paper, this paper may be kept a long time.

"To render this violet-blue 'silver chloride paper,' prepared exactly according to the above-mentioned method, suitable for producing all the colours, including white and black, he proceeds in the following manner: A solution composed of 15 grammes of pure potassium bichromate and 15 grammes of purified copper sulphate dissolved in 100 grammes of water is prepared. He crushes 15 grammes of mercurous nitrate so as to obtain a very fine powder, which is dissolved in as small a quantity as possible of water, rendered slightly acid with nitric acid. The solution of potassium bichromate and copper sulphate is heated on an open fire until it boils, and, while the mixture is stirred, the solution of nitrate of mercury is poured in. Finally the whole is put on the side of the fire, in order that the reddish-yellow deposit or precipitate may be formed and the solution allowed to cool.

"This is filtered, and made up to 100 cubic centimetres. If the filtrate amounts to more than 100 cubic centimetres it is reduced to that volume by evaporation. This solution keeps well, and must not be strengthened.

"The blue silver chloride paper is next immersed in the liquid prepared as above, and turned over for half a minute. It is then drained and placed in a 3 per cent. solution of zinc chloride, shaking the vessel until the said paper has again turned blue. The paper is then well washed in running water. It is pressed between blotting-paper, and placed again for six minutes in the mercury bath. On being removed from this bath, and pressed between blotting-paper, it is ready to be exposed. The paper must not be allowed to dry before it is exposed, as the exposure has to take place in the damp state.

"After the exposure, which varies according to the light and the season, and which is determined by a little practice, the yellow and green portions will be already well defined upon the paper, whilst the other colours, including the white, are covered with a yellow veil. For removing this the photograph is put in a developing bath. However, before this takes place the green and yellow colours, which are visible upon the photograph and could not withstand the developing bath, must be covered with a coating of varnish. When this coating is dry, the bath cannot act upon the varnished portions, and the colours will be protected at the said portions.

"After each varnishing the layer or coating is heated over a fire, in order that the varnish may spread uniformly. The photograph is not introduced into the developing bath, which consists of a 2 per cent. solution of sulphuric acid, until the varnishing of the yellow and green portions and the drying of the varnish has taken place.

> The photograph being left in this bath, the vessel is agitated and the yellow veil disappears. All the colours, including white, appear in all their brilliancy. It is then washed rapidly in running water, and dried between blotting-paper.
>
> "For fixing and finishing the image, after the photograph has been taken from the developing bath and washed, it is again put in the mercury bath for five minutes, and thence transferred to the developing bath until the colours, including the white, appear again. From this moment no more washing is needed, but simply pressing. Next, the photograph is coated with a solution of gum arabic containing 5 per cent. of sulphuric acid; this solution of sulphuric acid and gum must be prepared beforehand, because a precipitate is formed, and the solution must be used clear. The photograph, coated with this solution, is dried by heat and finally varnished."

It is unnecessary for us to point out that this has considerable similarity to Poitevin's experiments.

A reversing eyepiece for the stereoscope has been patented by Mr. Birt Acres, and this enables one to obtain a print or transparency from an uncut stereoscopic negative, thus avoiding the trouble of separate mounting and binding.

M. Paquelin has devised an incandescent platinum light. A strip of platinum coiled on itself is placed in a platinum cup with a hollow stem; a mixture of air and hydro-carbon vapour is then introduced under pressure. The mixture is lighted, and the platinum coil becomes incandescent, the intensity being in proportion to the pressure.

Carbon printing without transfer seems at first sight somewhat paradoxical or a retrograde movement, this being the first step made by the early experimenters; but a patent has now been applied for, which claims the sensitising of gelatine spread on mica for the carbon process, the exposure being made through the mica. As pointed out by the Editor of the *British Journal of Photography*, if any transparent material is to be used, xylonite or celluloid should be chosen, as mica can only be obtained in small sheets.

Experiments have been made to utilise aluminium in the form of powder to replace magnesium for flash work, the advantages being that there is not so much troublesome product of combustion.

Herr Valenta has published a monograph on the developing of printing-out gelatino-chloride prints, a full translation of the same being given in the *Amateur Photographer.*

Two new developing agents—Methol and Glycin—both derivatives of Paramidophenol, have been suggested, but obviously the verdict in their favour or against them is as yet impossible to decide. From all accounts they at least promise to be worth attention.

The following are the leading publications of the past quarter :—

The American Annual of Photography and Photographic Times Almanac for 1892. Published by Hampton, Judd, & Co., 17, Farringdon Street, E.C.

Rapport Général de la Commission Permanente nommée par le Congrès International de Photographie. Published by Gauthier-Villars et Fils, 55, Quai des Grands Augustins, Paris.

Photographischer Almanach und Kalendar für das Jahr 1892. Published by Ed. Liesegang, Dusseldorf.

The Optical Lantern for Instruction and Amusement. By Andrew Pringle, F.R.M.S. Published by Hampton, Judd, & Co., 17, Farringdon Street, E.C.

Lantern Slides: How to Make Them. By A. R. Dresser (2nd edit.) Published by the Fry Manufacturing Company, 5, Chandos Street, Charing Cross, W.C.

Die Praxis der Moment-Photographie. By L. David and Charles Scolik. Published by Wilhelm Knapp, Halle-a-S.

The Photographic Review of Reviews. Edited by W. D. Welford. Published by Iliffe & Son, 3, St. Bride Street, London, E.C.

Instruction in Photography. By Captain W. de W. Abney, C.B., R.E., D.C.L., F.R.S. Published by Piper & Carter, 5, Furnival Street, Holborn, E.C. 9th ed.

Congrès International de Photographie, Vœux, Résolutions, et Documents. Gauthier-Villars et Fils, Quai des Grands Augustins, Paris.

Recettes Photographiques. By Abel Buguet. Second series. Published by the Société d'Editions Scientifiques, Place de l'Ecole de Médecine, 4, Rue Antoine Dubois, Paris.

Verzeichniss der von der k. k. Akademie der Wissenschaften in Wien herausgegebenen und derzeit vorräthigen Schriften. Published by F. Tempsky Tuchlauben, 10 Wien 1.

The Photographer's Indispensable Monthly. Published by Adams & Co., of Aldersgate Street and Charing Cross Road.

Travellers' Colloquial Italian. By H. Swan. Published by David Nutt, 271, Strand, W.C.

Taschen-Kalendar für Amateur Photographen. By Dr. A. Miethe. Published by Rudolf Muckenberger, Berlin.

Bromide Paper, Instructions for Contact Printing and Enlarging. By Dr. E. A. Just. Translated by W. E. Woodbury and H. Snowden Ward.

The Optics of Photography and Photographic Lenses. By J. Traill Taylor. Published by Whittaker & Co., 2, White Hart Street, Paternoster Square, E.C.

The Modern Odyssey, or Ulysses up to Date. With thirty-one illustrations in Collotype. Published by Cassell & Co., Ld.

JILTED.

Woodbury-Gravure. Mrs. S. Francis Clarke.

THE

PHOTOGRAPHIC QUARTERLY.

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ON DEVELOPING PICTURES ON PRINTING-OUT CHLORIDE OF SILVER EMULSION PAPER AND PLATES.[1]

A DEVELOPMENT of chloride of silver emulsions has indeed been known for some time, and was worked out by Eder and Pizzighelli.[2]

These experiments were specially directed to the chemical development of chloride of silver pictures and certain photographic papers, which, in fact, by the aid of alkaline hydroquinone solution, ferrous citrate, etc., were very successful. These papers, however, were those prepared with excess of alkaline chloride, and were not therefore suitable for direct printing-out, but only for the special purpose of developing (papers for enlargement).

Papers also which are specially intended for printing out, and contain excess of soluble silver salts (citrate, tartrate, etc.) can be used for the preparation of pictures by means of development without the results obtained essentially differing, when correctly treated, from those obtained by direct printing out, especially when one has dense negatives and insufficient light.

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[1] *K. K. Lehr und Versuchanstalt für Photographie und Reproductions Verfahren in Wien.*

[2] Photographie mit Chlorsilber-Gelatine und Chemischer Entwicklung, 1881.

1. The duration of printing may be reduced to one-fourth or one-fifth of the time necessary for complete printing out of the print.

2. By the aid of magnesium light also (1—2 grs. magnesium powder) prints capable of being developed to a warm tone can be obtained by collodio-chloride of silver paper.

3. By the use of certain developers, tones may be obtained which cannot be obtained by the printing-out process.

4. It is possible by the aid of the developing process to obtain finished prints, as well with an extremely faintly impressed image as with one almost completely printed out.

Already many experiments have been made in different directions to find a developing process which possessed all the above advantages, and these experiments, till a short time ago, were confined to the use of gallic acid as a developer, which compound has been used for a long time for developing pictures on prepared linen and salted papers. Formulæ which contain gallic acid as the active principle should be used for developing chloride of silver emulsions which were intended for the printing-out process. Amongst others Liesegang[1] recommends a developer composed of water, gallic acid, acetate of soda, and tannin. Lebiedzinsky[2] gave a similar receipt as follows :—

Distilled water	1000	parts.
Gallic acid	4	,,
Citric acid	6	,,
Sodium acetate	20	,,
Lead nitrate solution (1 : 10) .	15—20	,,
Filter.		

The developer is suitable for Lebiedzinsky's collodion paper; trial of the same with Kurz's celloidin and aristotype papers, which were instituted, gave no favourable results. The first named celloidin

[1] *Archiv*, xxxiii., p. 31.

[2] Sposab. Uzigia papierer kolod jonowega emulsygnego, Warsshau, 1891.

paper became covered in developing with a gray, powdery, slimy film, and pure whites could not be obtained. Somewhat similar acid developers have been given by Legros,[1] Bourgois,[2] and others.

M. Bourgois showed some fruits of his developing process in 1891 at the Photographic Club in Paris. His developer is composed of a solution of gallic acid in water, with acetic acid and acetate of lead, and was only used and recommended for his aristotype paper; experiments with other papers proved that it behaved exactly like the other gallic acid developers, and generally gave unfavourable results.

In the *Amateur Photographer* we also find developing formulæ for the same purpose, and which should give good results on aristotype paper. They consist also essentially of gallic acid, neutralised with carbonate of potash, and used in concentrated solution. Also with these developers it was not possible to obtain good results with the various commercial papers coated with chloride of silver printing-out emulsions.

The developers containing gallic acid are more or less disposed to spoil quickly, and give as a rule tones which are by no means pleasing, and pictures without pure whites.

The method, published by E. Valenta,[3] of developing faintly printed images on different collodio- and gelatino-chloride printing-out papers, permits the use of other developing substances than gallic acid, gives prints which fulfil to the very highest degree all requirements as regards tone and clearness. This process consists in *the use of acid developers, which contain pyrogallol and hydroquinone as reducing agents.* These two agents cannot be used in alkaline solutions for the purpose, but give in conjunction with neutral sodium sulphite and citric acid or other organic acids, such as tartaric and acetic acids, very good developers.

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[1] *Bulletin de la Société Franc. de Phot.*, 1891, p. 152.
[2] *Allg. Anzeigebl. f. Phot.*, 1892, p. 20.
[3] *Photogr. Corresp.*, 1892.

The formulæ recommended for Valenta by this purpose are as follows :—

HYDROQUINONE DEVELOPER.

A.	Hydroquinone	10	parts.
	Alcohol	100	,,
B.	Sodium sulphite	100	parts
	Distilled water	500	,,
	Citric acid	5	,,

For use, 50 parts of Solution A should be mixed with 50 parts of Solution B, and 1000 parts of water added.

PYROGALLOL DEVELOPER.

Distilled water	1000	parts.
Sodium sulphite	100	,,
Pyrogallol	10	,,
Citric acid	11	,,

The ingredients should be dissolved in the water in the above, and the clear and almost colourless solution used immediately.

The hydroquinone developer works clear and slowly; the violet tone of the printed-out image turns in developing into a yellowish-brown. The prints were toned and fixed in the combined toning and fixing bath composed as follows :—

Distilled water	500	parts,
Hyposulphite of soda	200	,,
Sulphocyanide of ammonium	25	,,
Alum	30	,,
Acetate of lead solution (1 : 10)	40	,,

This solution is to be heated on a water bath to about 60° C., by which a quick deposition of the precipitate formed is obtained. It should then be filtered, and 100 parts of it mixed with 50 parts of water and 10 parts of 1 per cent. solution of chloride of gold. In this combined bath the yellowish-brown developed prints assume a yellow tone, which very soon turns into brownish-red, and into a beautiful deep, purple brown. The toning process should be stopped when the prints have assumed the desired tone, and it should be noted that after washing the tone is rather deeper.

The pyrogallol developer worked cleanly with the different papers which were used in these experiments, and the image developed more quickly than with the hydroquinone. The pictures developed with it quickly assume a purple black tone in the combined bath.

Both developers, even in open vessels, will keep for a week. Used developer deposits, after standing for some time in the air, a slimy precipitate, from which it may be freed by warming and filtering.

The citric acid acts in these developers as restrainer, and keeps the image clear. By use the developer takes up soluble silver salts, and therefore it happens that a once used developer acts at the same time as an intensifier.

So far as the particular kinds of paper which were used for Valenta's experiments, they were the so-called celloidin or collodio-chloride paper of Kurz of Wernigerode, Christensen of Sweden, Rotter of Maine, etc., as well as the gelatino-chloride papers of Bühler, Obernetter, Mignon, and Lumière's papier au citrate d'argent, and all gave very good results.

With these developers also Valenta's resin emulsion paper [1] can be developed, but this paper must be sensitised differently to usual. The sensitising of this paper, when it is to be used for developing pictures, must be effected by a solution of 12 parts of silver nitrate, 100 parts of water, and 10 parts of citric acid. The resin paper, sensitised by floating on the above solution for three minutes, should be dried, and now faintly printed so that scarcely the outlines of the image are visible. These prints can now be easily developed in the above-mentioned pyro. developer, and give, when treated in the combined bath, pictures of pleasing brownish violet tone, whilst in the ordinary fixing bath they assume a reddish brown tone, and the whites are less pure.

The Mignon paper, as well as the resin paper, ought to be very suitable for enlargements by the aid of a powerful source of light,

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[1] *Photogr. Corresp.*, 1891 and 1892.

such as the solar camera or electric light. Experiments in this direction will shortly be undertaken in the *K. K. Lehr. und Versuchsanstalt.*

R. E. Liesegang[1] has not obtained the desired results on his aristotype paper by using these acid developers, and recommends therefore specially for Liesegang's aristotype paper the following developer, which is analogous to the old gallic acid developer, and instead of the gallic acid contains pyrogallol and paramidophenol.

A. PYROGALLOL DEVELOPER.

Solution of pyro. (7 %)	2 parts.
,, ,, sodium acetate (20 %) .	6 ,,
Distilled water	60 ,,

B. PARAMIDOPHENOL DEVELOPER.

Solution of paramidophenol (7 %) .	2 parts.
,, ,, sodium acetate (20 %) .	10 ,,
Citric acid	1 ,,
Distilled water	50 ,,

We have tried these developers; both, even in closed vessels, become brown in a short time, since a decomposition sets in; they will not keep. In use these developers quickly assume a dark brown colour, and deposit considerable slime; finally, they cannot be used for many other papers, since these are completely blackened by them.

To follow out our experiments, it is only necessary to use the modified hydroquinone developer,[2] and to expose somewhat longer than is necessary with other papers, to obtain very good results with this paper.

The different emulsions intended for printing out are more or less suitable for the preparation of transparencies or opals, by means of which very beautiful results can be obtained by Valenta's developing process. Such plates as are prepared by the firm of Schattera of Vienna are characterised by a thin transparent film. To use them for direct printing out is somewhat difficult, because

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[1] *Photogr. Arch.*, 1892.

[2] As recommended by Valenta for developing chloride of silver printing-out plates (see further on).

they cannot be so easily examined as in printing pictures on paper; also, they do not give, without the use of the developing process, that richness of tone which is attained by the aid of the developing process.

Valenta recommends for this latter purpose two kinds of developers: (1) the hydroquinone developer, and (2) the pyrogallol developer. The hydroquinone developer is specially suitable for the preparation of red and violet tones. It consists of—

Water	1000 parts.
Hydroquinone	15 ,,
Citric acid	3 ,,

Instead of citric acid, acetic or tartaric acid may be used of a strength of five parts to the above quantity of liquid.

The faintly printed pictures are placed in the developer, and during development the solution must be kept in constant movement. The image develops evenly, and assumes a yellow to brown colour. One should develop rather vigorously when the picture is to be used for window decoration. Opals and transparencies which are to be used for enlargements should not be developed so long. When the development is finished, the picture should be well washed with water, and placed in the combined toning and fixing bath, which we have already mentioned. It assumes in this, first a yellow, then a red, reddish violet, and finally a purple black colour.

When the desired tone is obtained, the process should be interrupted, and the plate well washed in running water.

With the hydroquinone developer, red and reddish-brown tones are easily obtained, whilst the pyrogallol developer gives rather violet red to black tones, with similar treamtent in the toning and fixing bath. If sepia-brown tones are desired, the use of the following toning and fixing bath can be recommended:—

Water	1000 parts.
Hyposulphite of soda	100 ,,
Ammonium acetate	100 ,,
Solution of chloride of gold (1 %) . .	30 ,,

Another process to obtain reddish tones to the above-mentioned method, is the use of a separate toning bath, as recommended some time ago for paper, and previous fixing in a neutral fixing bath :—

A.	Water	500 parts.
	Sulphocyanide of ammonium . .	20 ,,
	Hyposulphite of soda	1·5 ,,
B.	Water	500 parts.
	Solution of chloride of gold (1 : 50) .	30 ,,

The solutions are mixed in equal parts before use.

It should be mentioned here that the fixed pictures must always be well washed, best in running water, for in case of insufficient washing the whites after a short time become yellow, whilst well-washed pictures have an unlimited keeping power.

Hydroquinone developer works slowly and clear, and by the use of the above described toning and fixing bath it is easy to obtain beautiful red tones, whilst the pyrogallol developer acts quicker, and it is easier to obtain dark violet to black pictures. This developer was adapted to the above-named emulsion plates, and as the most advantageously working mixture, the following formula has been composed on the basis of very many experiments :—

Pyrogallol	20 parts.
Water	1000 ,,
Citric acid	16 ,,
Sodium sulphite	50 ,,

This developer works very quickly, the pictures develop very vigorously, and assume a brown colour ; they take, by subsequent treatment in the toning and fixing bath, very easily violet, blue-black to black tones, for which the developer is to be strongly recommended. The property of developing quickly makes the same very suitable for faintly printed pictures, which with long-continued development would easily assume a hard character.

The sketched-out developing process presents many advantages to the practical man, of which, in the first place, should be mentioned that he is made in a certain sense independent of the

duration of insolation. Since, indeed, an examination of plates intended for printing out is not possible, it is certainly not easy to determine the correct time for printing out. By the use of the developing process with acid developers, as we have here sketched out, this disadvantage is completely avoided. Under-printing or over-printing is excluded, since an exposure of ten to fifteen minutes with good daylight is always sufficient to obtain an image which can be well and safely developed.

A further advantage of the plates coated with the printing-out emulsion, which have now for the first time become usable by the practical photographer, lies in the fact that these plates show no visible grain ; whilst gelatino-bromide of silver plates, on account of their coarse grain, are not very suitable for enlarging, and even developed gelatino-chloride of silver plates show a distinct grain with moderate enlargement. I was unable with an enlargement of about 600 (Reichert system 8a, Ocul. 4) to discern a grain in the film ! This fact speaks for the employment of these plates for the preparation of transparencies for enlarging ; also from the fact that by the aid of the developing process and the said toning baths one is in a position to obtain any desired tone from red to violet and black.

That, after the above statements, good contact transparencies for projection (lantern slides) can be prepared, there is no doubt.

To the above described advantages should, in conclusion, be mentioned the pleasantness above the different plates for developing, which are prepared for similar purposes, that in using them the work in the dark room by red light is avoided, since all operations with the same can be carried out by gaslight or weak daylight, as is usual with ordinary printing papers. It may therefore be assumed that they will quickly make their way in practice for the above purposes.

J. M. Eder.
E. Valenta.

LIFE ON THE BROADS.

TO most of my readers the Norfolk Broads are a *terra incognita*, if I may be allowed to use an Irishism; and the first questions one is usually asked after describing a trip on the Broads are, What are the Broads? and how do you get there? We will answer the second question first, and it is one of some importance, if expense has to be considered, for the ways of the Great Eastern are not as the ways of other railway companies, and a slight knowledge of their peculiarities will be found very serviceable. The first thing to remember is that they thoroughly realise the bucolic simplicity of the Eastern Counties, and evidently do not wish to introduce any American go-ahead notions into these peaceful and somewhat sleepy districts. Thus, if you want to go to any business centre like Norwich, every difficulty is put in your way, and you must pay increased railway fares, as a sort of fine for your undesirable energy; but if your soul hankers after a Sleepy Hollow kind of existence, then the Great Eastern will welcome you as a child after its own heart, and will give you tickets at half-fares, with considerable extension of time for the return journey, so that you may have plenty of time to chew the cud of contemplation and dream away your life in undisturbed serenity.

A stranger who is unused to these ways is at first apt to resent them, but a short holiday spent in these old-time regions will soon convince the most go-ahead and restless individual that after all the railway companies are right, and that they have fitly grasped the spirit of the country they traverse. Life here is as different from the busy toil of cities as the dream of the lotus-eater is from the whirl and roar of a Lancashire cotton mill.

Mills there are in abundance, but they are sleepy old things

which neither grind nor spin, but merely pump the water in a leisurely fashion of their own from the lowlands to the higher level of the river.

Before we decide on our route, perhaps it would be as well to make up our minds how we are going to make up our party. Is it to be a small and select party of one? or are we to number a dozen? We will assume that we decide on four or six—either will do equally well—and each must decide for himself which he prefers. Having decided on the numbers, we must next choose our companions; and this is, after all, the most important point. All must be congenial, yet all should be unlike. To choose the members of a party of this sort requires as much skill as the proper concoction of a salad. If all are of one kind, it is as dull and heavy as a potato salad. If the selection is made with skill, and oil and vinegar are mixed in their right proportion to give a dressing to the rest, then the result will be as perfect as a French salad made by one whose skill borders on genius. Avoid anything of too strong flavour. Thus, the man with a fad or too decided hobby must be judiciously left out; yet each should have sufficient character to react on the rest. But to describe the different characteristics which go to make up the ideal party is impossible. You may give a recipe for a dainty dish to a clown, but it requires the genius of a born cook to make it perfect to the taste. A good *raconteur*, if he be bright and witty, is invaluable. So is a good liar if he be really good, and not a common or garden Ananias. To be a good liar is given to but few, and if he can be found he is invaluable. The man must be a genius, and his most astounding lies must have all the finish and delicacy of truth. If one or two of the party are fairly musical and can sing a good song, they also will prove a great acquisition.

Having made up your numbers, one man should be chosen to boss the show, and his discretion should be absolute. He must decide where to go, how long to stay at each place, what provisions to lay in; and he alone should give orders to the men. If this is not done, it will often be found that a certain amount of

friction will arise, which may mar the enjoyment of the whole expedition.

Having decided on your numbers and chosen your companions, the next thing is to decide what kind of craft you will engage. The choice will practically lie between a wherry and a yacht. If you wish to be very comfortable, and to do no work, then a wherry will be the most suitable, as there is more accommodation, and the arrangements for cooking are far more complete. The usual way in which these wherries are fitted is to have a small cabin forward, commonly called the ladies' cabin, fitted with two berths, wash-stand, etc.; then a large cabin with berths on either side running the whole length of the cabin, usually about twelve feet long. If more than two occupy this cabin, the best way is to lie feet to feet. In this way four can sleep comfortably. In the daytime this cabin is used for meals, etc. A piano also is generally furnished, which will give the musicians of the party a chance of making sweet melody on wet evenings. Sometimes a single cabin is also found astern of the large cabin; and then comes the pantry and the men's quarters, where the cooking is done, two men being told off to each wherry to look after the sailing and general comfort of the passengers.

On the character of the crew it is needless to say that the comfort of all on board largely depends; and if they are treated with fair consideration, you will very rarely have to complain. But, as I mentioned before, it is essential that they should have only one man to look to for orders; otherwise, if one gives one order and another gives contradictory ones, endless confusion will ensue.

These wherries are wonderfully handy boats for these waters, and will sail very close to the wind, and, having only one large mainsail, can be worked by two men with great ease; thus there is nothing in the way of sailing for the passengers to do, though, if the wind is not favourable to sailing, they may amuse themselves with the quant, a sort of overgrown punt pole, which, when used by the uninitiated, is apt to cause much amusement to the rest, as the unfortunate wielder of the quant is very apt to take a quite

impromptu bath, much to his own surprise and the delight of those who have mischievously egged him on to try his skill. It is only right to add that no one should attempt this form of exercise, or indeed go out either in a wherry or sailing boat, unless he is a fair swimmer, as upsets are not very uncommon in the small boats, and even on the wherry it is not very difficult to slip off. For those who are fond of doing part of the work of sailing themselves, a yacht will probably commend itself in place of a wherry; for a

A Broad's Yacht.

party of four it is in many ways to be preferred. The crew will probably be composed of a man and boy, who have their quarters in the forepeak—the man to look after the sailing, etc., the boy to do the cooking and washing up. The class of boat will be perhaps best understood from the picture above.

The boy, as a rule, is not brilliant; but a good skipper will soon lick him into shape, if he has any germs of smartness: the youth of Norfolk, as a rule, however, are not remarkable for intelligence or knowledge, though they are well-meaning and very honest.

The following incident may perhaps illustrate the great progress they have made in the polite arts since the institution of the board schools. A country youth, who had never left his native village, was sent to Norwich, and arrived in company with his dog, hot, dusty, and thirsty; seeing a drinking trough which some benevolent person had put up for the benefit of thirsty animals, the dog attempted to slake his thirst, when the youth, who had never seen such luxuries in his native wilds, kicked the dog off, saying, "Coom out of it; theat beaint for the loikes o' thee," and kneeling down himself took a long drink, then washed his face in the trough, and no doubt felt very grateful to his unknown benefactor.

It was our luck on one occasion to have one of these brilliant boys, and for absolute ignorance of his duties he was truly remarkable; his culinary knowledge did not soar to great heights—he could neither boil an egg nor fry a rasher of bacon; and his idea of making the cabin neat was to throw everything on the berths in a confused heap. On one occasion, when I was at the tiller, and so was unable to move, I had the pleasure of seeing this heaven-born genius take a tin of sardines which had been opened and carefully turn it over to look at the other side, the oil running out in a lovely stream over my best rug. If I had been able to leave my post, I should have been tempted to drop him quietly overboard to feed the fish; as it was, I had to content myself with remonstrating with him in language more forcible than polite, which luckily brought the skipper to the rescue, who relieved the boy of the sardines before he had quite emptied all the contents of the tin. Luckily, it is seldom that one meets with such a specimen of ignorance and stupidity, some of the boys being very handy and quite equal to the simple cookery that one requires on these expeditions. Of course one does not expect a French *chef*, but if content with simple fare one may do very well. Eggs and bacon, sausages, kippers, for breakfast; canned meats, sardines, cheese, for lunch; and plain joints, tinned soups, and poultry for dinner, with canned fruits, should satisfy even an appetite which the open-air life on the Broads renders remarkably

keen. We have sometimes, when we hired our boat from Bullen of Oulton, got Mrs. Bullen to make us a couple of good-sized apple pies, which we found remarkably good. Everything necessary can be procured from the owners of the boats, but we usually took our canned goods and bacon, tea, coffee, and whisky, from town, and obtained bottled beer, soda water, marmalade, sardines, etc., from the owners of the boat; vegetables, poultry,

SKIPPER BEN.

new-laid eggs, butter, and milk can be obtained each day from the different farmhouses on the way; fresh meat is obtainable at many places, but, as a rule, they only kill once a week, so in this respect a little difficulty may arise, but the skipper will be able to give all the necessary information. In fact, if you treat the skippers in the right way, you will find them right good fellows, honest, willing to work, sober, and obliging. I have never met with any who were otherwise, though of course some are better than others.

The picture above is of one of the skippers, who rejoices in the name of Ben. I suppose he has another name, but I never heard it. He is well known about Oulton, and is quite a character; he has a remarkable capacity for putting away unlimited quantities of beer; but I have never seen him the least affected by it. In fact, I think he would drink the broad dry before he would lose his legs.

One of the best places from which to start is Oulton Broad, the

Reed Harvest.

station for which is Carlton Colville, which is the last stopping-place before reaching Lowestoft. At Oulton wherries, yachts, and boats of all descriptions may be hired from T. Bullen, who is thoroughly reliable in every way, moderate in his charges, and with a complete knowledge of all that relates to the comfort of his customers; he will also supply everything requisite, from a needle to a ship's anchor, and has some bedrooms which he will let for a few days while one looks round before deciding what boat to select. This is very convenient for those who are strangers to

these waters, and is certainly advantageous if plenty of time is available; but if time is limited write to Mr. Bullen, giving him full particulars of your requirements, and the number of the party, and he will fix you up with everything necessary.

Very good boats may also be hired from Wroxham, which is a very favourite starting-point, but the prices charged are usually higher than those charged by Bullen.

Wroxham is very accessible, as there is a station close to the river within easy reach of Norwich, and is close to some of the prettiest broads, such as South Walsham and Ranworth, and is near the points where the Thurne and the Ant join the Bure river; so that plenty of choice is given in the selection of the route to be followed.

If you are not of a roving disposition, and prefer peace and quiet, Barton Broad will probably suit you best. This is a large broad, and not nearly so much frequented as Wroxham or Hickling; it can be reached by water by sailing down the Bure to the mouth of the Ant (the river I mean, not the insect); and then, passing under the bridge, and sailing and quanting up the Ant for about four miles, we reach Barton. The reason that this broad is not more used probably is owing to the fact that the largest wherries are unable to pass under the bridge, and as the Ant is a rather narrow river the quant has to be used somewhat frequently; the extra trouble will, however, be well repaid, as Barton Broad is not only one of the largest, but one of the most beautiful of all the broads, especially at the western end towards Irstead, which, curiously enough, is less visited by strangers than the other parts of the broad.

If you prefer the comfort of an inn to the limited accommodation of the boat, excellent quarters can be found at Neatishead, a charmingly situated village at the western end of the broad, where the host, Mr. Haylock, will make you so comfortable that you will be in no hurry to leave. For the painter or photographer there are endless opportunities and inexhaustible subjects.

Neatishead is within easy driving distance of Wroxham, and

Mr. Haylock would send over a trap to meet the train if you preferred to go by road. Boats can either be sent round from Wroxham, or can be obtained from Messrs. Press Brothers, of North Walsham, who have some very comfortable and well-appointed wherries at reasonable prices.

The favourite time for a visit to the Broads is about August, and certainly they are very beautiful at that time of year, when the reed harvest is just beginning; but it wants the painter to do justice to the exquisite tints of reeds and lilies and the delicate harmonies of colour. Still, some faint idea of the luxuriance of the vegetation may be gathered from the accompanying picture of—

Lilies and Reeds.

But each season has its own charm, and it is impossible to say which is absolutely the best time to visit these lovely waters. Some of the most enjoyable times I have had have been in the early spring, when the frost was thick on the windows and the decks were covered with snow. With plenty of warm clothes and a good pilot jacket, the cold is soon forgotten in the excitement of

a sail over Breydon Water in a strong March gale; while the magnificent cloud effects are beyond all powers of description.

In the depths of winter even the Broads are by no means at their worst; and only those who have tried an ice-boat on Hickling or Barton have any notion of the mad, wild exhilaration which thrills through one as the boat skims over the ice at express railway speed. Miles of skating too can be obtained when the frost is severe; and though we miss the picturesque and quaint pictures of Holland, we have plenty of fun and amusement, and a climate so bracing that the veriest dullard becomes a wit.

So when you ask me when you should go, I reply, Go at all seasons, and each one will seem more perfect than the last. Are you a sportsman, then shall you find wild duck in profusion; are you a fisherman, then shall your catch be greater than St. Peter's; are you a poet, then can you in the sweet solitude of Barton find inspiration, or on the wild waters of Breydon be carried away by the inspiration of the spirit of the storm; are you a painter, then shall you find pictures on every side; are you but a worn out toiler of cities, there shall you find rest, peace, and health.

E. J. Humphreys.

ART STUDIES.

WRITERS on photography and photographers, amateur and professional, are never tired of writing and saying of what great use photography is to painters. That photography is of use to painters is of course a truism which no artist of note is likely to deny, although it is unfortunately only too true that it has been denied, and indignantly denied, by a few of the lesser men. It is neither my wish nor my intention to argue this question here. My present object is—taking it as an established fact that most if not all artists, other than photographic artists, use, with great advantage to their work, photography in one form or another—to show that, if photographers only chose, they could do much more than they now do to help painters, and thus add greatly to the artistic results of the age.

Painters should neither copy photographs nor use a photographic base for their pictures; not alone because of the immorality of such a proceeding, but also because the result obtained could hardly be artistic. Independently of the charm of colour, a picture owes its real artistic power to the impress it receives of the individual mind and artistic perception of the painter.

The painter is, probably, chiefly indebted to the photographer for views of various countries, and for the portraits of living, or recently living, persons. There is, of course, an extremely good series of animal photographs, but there is plenty of room for more. Cloud photographs, although lacking colour, are beautiful and useful studies of nature. Very few photographs are taken specially for the purpose of being used as artistic studies; and it is because I think this a loss to art that I am writing this article in favour of some photographers taking up such work as a branch, at least, of their profession. Photographs of buildings and architectural details

are much wanted—photographs which would be really truthful mechanical drawings, not picturesque, or so-called picturesque, views. Wherever the form of a thing is wanted to be recorded for future use the camera should be used. All who have had any experience of figure-drawing must know how difficult and how important is the drawing of hands. Here is indeed a chance for an enterprising photographer to take a series of hand pictures—all sorts and conditions of hands: babies' hands, grandparents' hands, ladies' hands, mechanics' hands.

Although any painter worthy of being called an artist can paint a picture more beautiful than the most artistic photograph, yet the greatest artist is not so truthful, to say nothing of so rapid, a draughtsman as the camera in the hands of a competent operator. In this magazine I have more than once advocated the retouching of photographic negatives; but photographic studies for the use of artists should not be retouched in such a manner as to add a beauty to them, but only so far as to correct and make them more truthful representations.

If the "British Matron" reads the PHOTOGRAPHIC QUARTERLY, and has—which is very unlikely—read my article so far, I now advise that most worthy, if mistaken, lady to read it no farther. It is generally acknowledged in all civilised nations that the highest form of art is the reprèsentation of the nude human figure. As we all know, there are professional models who sit to artists without their clothes to enable the artists to properly study and paint the human form. *Honi soit qui mal y pense.* I do not, for one moment, see anything immoral or degrading in thus gaining an honest living; but, for a young artist, the pecuniary expense of engaging such models often is a serious consideration. What I would advocate is that a series of nude photographic studies should be taken by a really first-rate photographer for the use of artists. I do not say that such photographs should be placed in shop windows for public sale; although, for my own part, I can see no reason why they should not be perfectly decent and purely artistic. The advantage of these studies would be enormous to

figure-painters; and although in the case of painting a nude subject the artist would probably require a sitting from a living model to finish his work by, yet all except the finishing touches could be done from photographs. One great benefit of such photographs would be the quickness with which they could be taken, for it is often a difficulty both the artist and the model have to contend against that the position required to be represented, however natural it may be, is one that is very trying, if not impossible, for the model to maintain for any length of time.

The painter can be, and is, of great help to the photographer, and the photographer can be, and is, of great help to the painter; but this is no reason why they should not be of still greater help to each other, and thus add to the happiness of mankind generally by adding to the art beauty of the world.

Alfred Paterson.

SOME POINTS IN EXPOSURE.

"I WOULD have every one write what he knows, and as much as he knows, but no more," says good old Montaigne, and with this advice in my mind I feel that I cannot do better than touch upon some matters connected with exposure which I have experimented upon for a definite purpose. And although these investigations have been in connection with the instructions for the use of that little instrument of observation and calculation which bears my name, I am now writing for all who uncap a lens, and who are therefore bound to take into consideration the somewhat complex influences which affect an exposure.

My first proposition may appear startling; it is that there is no such thing as an absolutely correct exposure for a given group of objects under given conditions. Let us look the problem squarely in the face: we have before the camera a group of objects which vary widely in colour, and therefore actinic reflecting capacity. They may vary from the blue sky flecked with fleecy clouds, to the bright green grass in the foreground of the landscape. Our aim is to give such an exposure that the actinic light reflected from each object shall act on the plate to form an image which, when developed, shall be of suitable opacity to print a positive image which shall correctly represent the appearance or luminosity of the object. But, alas! we know that this aim is never attained, the best exposure to give the true value of the sky in the finished picture is so short that all the rest would be hopelessly under-exposed, while an exposure long enough to correctly render the luminosity of the grass would not only hopelessly over-expose for the sky, but would be too long for the intermediate colour values of tree trunk, gravel walk, or stone wall. What, therefore, is glibly spoken of as a "correct exposure" is simply the best

compromise that can be made in the matter, a compromise which leans decidedly towards the exposure for the grass. It is always possible to fix upon some imaginary colour—say a grey green or a grey orange—which may be regarded as the colour to expose for; and, in fact, if a board were painted this average colour and included in the subject the final print should accurately render its true value. The standard subject number of 100 in my exposure system represents this colour, and one standard colour would hold good for the great majority of landscape, interior, and portrait work. In my experience an exposure which gives the correct value of red brick is the best compromise for an average landscape. I am aware that red brick is usually said to require increased exposure, but careful measurements of opacities of negatives do not confirm this view, as it has a great deal of grey blended with the orange.

The second point I call attention to is that the compromise which represents "correct exposure" to one worker, is very often not correct for another photographer. One man using a quick flash out developer, and preferring a thin negative for use with bromide or gelatino-chloride paper, may find the second the best exposure for his purpose. A second worker with the same lens, stop, subject, and light would be utterly unable to get satisfactory results with the second, for he, printing in platinum, requires a fairly dense negative with full range of tones and no clear glass, and for this purpose uses a well-restrained developer with a minimum of alkali; and does not "develop all out," but takes the plate out of the dish when there is still possibility of getting more density. For this last man's purpose three seconds will probably be the best exposure, and my standard of exposure is much the same as his.

My aim in calculating an exposure is not to find the shortest time which will give a passable result, but the time which gives the best possible result with an ordinary (not forcing) developer. Such an exposure causes with most plates a considerable amount of apparent surface fog on the negative in outdoor work—which usually is cleared away in the fixing bath.

It will probably be argued, "If there is no such thing as an

absolutely correct exposure, where is the use of an instrument for this purpose?" The answer is, as regards my own exposure meter, that when used according to the instructions it is a means of *calculating variations from one test exposure*, which test must be made by the user. When a speed number for a particular plate is given it is impossible to say that another photographer's test shall coincide with it, unless he uses a plate from the same batch of emulsion, the same developer, at the same temperature, for the same length of time, and unless his standard of a perfect negative is the same as that of the original tester. In any system of exposure the speed value of the plate can therefore only be taken for the basis of a trial exposure.

Instantaneous Work.—Careful comparison points to the fact that the average shutter picture (even those which are considered successful) has only received an exposure of about one quarter that which gives the best possible result, and that this deficiency is partly made up for by careful development. The moral is to use the quickest possible plate, and as slow a shutter speed as is necessary to prevent movement in the object.

Plates.—My experience in this matter may be of interest, as I have tested almost all makes of plates and films (both English and foreign) in order to give their speed value for use with my instrument.

And yet it is quite impossible to answer the question, "What is the best plate to use?" There are some plates of better quality than others, and the cheap one-shilling-per-dozen ones are, as a rule, comparatively poor in film, but really bad plates are now seldom met with.

The increase in rapidity in the top brands of English plate-makers has been very marked within the last eighteen months, and it is impossible to say of any brand that it is the quickest made, for several are on much of an equality, and those makers who are behind in this matter are continually improving. While the most rapid plates are most useful for shutter work, they possess no special advantage to the average photographer. On the other hand, I have modified my old opinion that slow plates are

best for landscape use, and I find it more convenient to carry a fairly quick plate, say one twice the rapidity of Ilford Ordinary; but only half the speed of the most rapid plates made. Plates may be divided into two classes—"hard," giving sharp contrast, and "soft," having a tendency to keep the high lights down and bring up the detail in the shadows. For special uses each has its good qualities, but in my experience the speed number of a plate gives no information on this point, and it by no means follows that a slow plate is in the "hard" class and a rapid plate in the "soft." On the contrary, several of the most rapid brands have a tendency towards density and contrast.

Latitude of Exposure is another point on which some misconception exists. It is true that a very thickly coated plate will not give good results with exposures varying, say, from one to four seconds, while the same emulsion thinly coated, or with a small amount of silver to the gelatine, will not give good results over a wider range than one to two. But I find the popular idea that a slow plate gives "greater latitude" than a quick one has no foundation whatever. It probably had its rise in the fact that the difference in exposure between three-quarter second and one second is not easy to make, whereas in using a slow plate the difference between three and four seconds (the same ratio) is perfectly easy.

I have tested many scores of plates with three exposures in the ratio of 1, $1\frac{1}{2}$, and 2 on the one plate, and the difference in density and general detail between the three exposures has been much the same on all brands of plates. In order to get the same result with two seconds' exposure that you would with one second, it is necessary to develop a shorter time, or for the same time with a restrained developer.

Distance has no effect whatever upon the exposure of any objects which can be approximately in focus at the same time; but the amount of haze or mist in the air has a considerable effect. For instance, on a foggy day the landscape may fade into sky (through the presence of fog) at twenty yards' distance, while on a clear day

hills five miles away may stand clear against the sky, and have so little mist intervening that they require the same exposure as objects a few yards distant.

The popular idea of the effect of *distance* on exposure arises from the facts—(1) the presence of mist decreases the exposure, and in distant objects a larger bulk of it intervenes; (2) that objects so near as to be out of focus require longer exposure on account of their focus not coinciding with that of the others; (3) that where an object with a shadow side is near the camera, the shadow detail is so important that an increased exposure is required to render it; whereas, if the same object and the same shadow were some distance away, the shadow would become so unimportant that a practical man will not expose for it.

Calculating Pinhole Exposures.—A pinhole exposure follows the same rules as if taken with a lens, and depends upon ratio of aperture to distance from pinhole to lens. Captain Abney has given a formula for finding the best aperture for any given distance. It is, however, not within the power of most photographers to measure such small apertures, and in devising means for calculating pinhole exposures with my instrument I have discovered a plan which will much facilitate matters. Ordinary sewing needles are made to standard sizes and numbered, and can be used to punch holes of definite sizes in thin sheet metal. I have measured the sizes of needles from No. 1 to No. 10, and in the subjoined list give also the proper distance from plate to each size according to Captain Abney's formula. When the hole is punched the burr can be removed with a fine file, and the needle passed through a second time. Another difficulty now crops up. The ratio of aperture to distance is so small a fraction as to be outside the usual experience of photographers, and not marked on any exposure instrument or tables.

If, however, *ten times* this fraction is taken for the purpose of calculation, and the estimate of exposure made by any method best known, the photographer has only to give *one hundred times* this estimated exposure to get the correct result.

For instance, it is decided to use a distance from pinhole to plate of twenty inches. My table gives the information that No. 4 needle ($\frac{1}{28}$ inch) will punch a hole of the right size, that this gives a ratio of $\frac{1}{560}$, but that if the photographer estimates the exposure as if it were taken with a diaphragm of *f*/56, and then multiplies his estimate by one hundred, he gets a correct exposure.

No. of Needle.	Diameter.	Distance to Plate.	Ratio.	Calculate as
1	$\frac{1}{22}$ inch	32 inches	$\frac{1}{700}$	*f*/70
2	$\frac{1}{23}$ "	28 "	$\frac{1}{640}$	*f*/64
3	$\frac{1}{26}$ "	23 "	$\frac{1}{600}$	*f*/60
4	$\frac{1}{28}$ "	20 "	$\frac{1}{560}$	*f*/56
5	$\frac{1}{31}$ "	15 "	$\frac{1}{460}$	*f*/46
6	$\frac{1}{34}$ "	13 "	$\frac{1}{440}$	*f*/44
7	$\frac{1}{39}$ "	10 "	$\frac{1}{390}$	*f*/39
8	$\frac{1}{44}$ "	8 "	$\frac{1}{350}$	*f*/35
9	$\frac{1}{49}$ "	6 "	$\frac{1}{290}$	*f*/29
10	$\frac{1}{54}$ "	5 "	$\frac{1}{270}$	*f*/27 and multiply by 100.

ALFRED WATKINS.

CAMERA PICTURES AND THEIR CRITICS.

"It speaks in them, and their whole being, transmuted by that glorious sunlight into whose rays they have dared, like the eagle, to gaze without shrinking, becomes a harmonious vehicle for the words of Deity."—CHARLES KINGSLEY.

WITH somewhat wearisome iteration photography has, during the polemic season just closed,—I mean the months intervening between the Pall Mall and Camera Club exhibitions,—been again and again haled before the "great unpaid"—*i.e.*, the amateur art critic—and roundly charged with obtaining credit for art under false pretences.

In the ordinary processes of civil law, what is technically called "vexatious prosecution" is in itself a punishable offence, and on reading over some of the allegations from time to time urged against the defendant, one cannot help thinking that they are rather the outcome of vexation, and intended to vex, than the product of any burning desire to demonstrate what is false. The fact that this captivating Cinderella of the Fine Arts should be growing so popular seems to stir up envy and anguish in the breasts of those who really might be expected to praise and applaud. Instead of doing which, they growl because some of Cinderella's sweethearts wear "long hair" and "velvet coats"—atrocious crimes!—or else seek to belittle her suitors by dubbing them "respectable citizens," and, of course, nothing more.

In fine, they, not to weary the reader, adopt the well-worn tactics of those who lack a strong case, that is, give undue prominence to immaterial side issues; ignore the charm of Beauty's face, and only speak of the freckles. They none of them like—some of them apparently loathe—photography and its votaries. Why, then, they no doubt reason, should they be sparing or heedful of their slings and arrows? Why, indeed?

But to us others, or some of us, who are not carried from one extreme to another, who do not alternate between adulation and malediction, there seems, despite all the vapourings of her detractors, to be some considerably saving virtues in this "nobody's child"; which, at all events, are sufficient to make us speak up for her.

We think her not merely fair in body, but the possessor of a mind capable of being impressed by our æsthetic influences. But then we know that all who seek to fully appreciate the wealth of her attractions must learn her language, study her somewhat skittish and ofttimes intractable habits, and, above all, be of good heart, of humble mind, and of enduring patience.

By way of antithesis to the above I quote a passage which will serve to illustrate the kind of irritable, hasty way in which photography may not be successfully practised, but in which it is too often criticised.

"If any student will select a suitable landscape and watch it under changing conditions of varying light and shade for a few months (!), making notes of every new effect, and taking photographs of the different effects, then comparing them with his notes, he will, at the end of six months, feel like kicking his lying camera to the zenith, and go stone-breaking as a more honourable employment."[1]

The writer of the above lines, whoever he may be, surely fails to grasp what is the essential genius of photographic procedure. It should be apparent to every one conversant with landscape photography, that it is simply, with our present means, futile to expect to secure a reasonable record of "*every* effect" in nature; to attempt to do this is of a surety to undertake "impossible photography." Indeed, the first lesson which we should all learn, is to know what we cannot do; to know within what limits we are confined. As for "comparing them with his notes," imperfect as, under the above unfavourable circumstances, the photographic

[1] "Ars," in *British Journal of Photography*, vol. xxxviii., p. 69.

notes might not impossibly be, they would certainly in many, if not all, material respects, as mere notes, be far more valuable than the MS. ones referred to.

No doubt those who so misprise what are photography's attributes might be inclined to kick their "lying camera to the zenith," although there is no more reason than there would be for any one who unsuccessfully attempted to photograph quickly moving objects in a November fog with a pinhole camera. Anyhow, the above is but an ordinary example of the philosophic manner in which some critics preach the doctrine of despair.

However, readers of this article are familiar enough with the kind of arguments which the said extract illustrates, for it is well exemplified in the essay which appeared in the January number of this QUARTERLY, called "Photography not Art"; of which more anon.

Another and more dignified but less entertaining type of those who seek to exclude photography from any kinship with fine art is Mr. J. K. Tulloch, who, in a carefully prepared paper read before the Dundee and East of Scotland Photographic Society, labours hard to prove that there is no connection whatever between the two; yet, after all, being honest, even at his own expense, he is constrained to say: "My position, then, is that photographs may to some extent show the art proclivities of the photographer; yet they are themselves not marks of fine art."

If a photograph can "show the art proclivities" of its maker, why refuse it the modicum of praise rightfully due to it for its evidence of design? Again, "It is not to be denied that the general character of a man's photographic work does indicate whether or no he has the feeling of a true artist in him" (J. K. Tulloch).

Unlike the aforesaid, Dr. Emerson, in "Photography not Art," likens the photographer to an engine-driver who only starts the locomotive; the simile is plausible enough, because it has much truth in it. To make it more correct he should have said instead of an engine a cycle, which in its operation is not solely mechanical, but subject to the motive power and the guidance of humanity.

In directing attention to the foregoing assailants of photography, who are, by the way, only a tithe of the whole, my object is not to examine in detail and attempt to refute all the more or less fanciful arguments which ingenious minds have put forward, but rather to demonstrate within the space at my disposal why many thousands of amateurs and professionals will, undismayed by the desperate denunciations of late so often indulged in, cling to this belief that art and photography have many bonds in common, and that under certain circumstances photographs may claim to be considered fine art productions. In carrying out this resolve, let us in the first place define—roughly—what is a work of art, or rather what are its components.

Take, for instance, a landscape (and for brevity's sake my remarks are mainly restricted to the consideration of landscape photography); recall to your minds a Constable or a Vicat Cole. Ask yourselves is it merely a figment of the imagination (x), as some people whose chief aim is to stultify everything photographic would almost have us believe? The answer must be: By no means. Is it, then, imagination fortified by composition (y)? Certainly not, say I. Apply imagination and composition to the production of a landscape in the planet Uranus and the result is —nothing. A work of art is the product of several factors, of which, if you like, imagination and composition are two very important ones, but none the less are they and all others perfectly impotent without the aid of a third one, whose name is truth (z); truth of form and tone and of colour. By multiplying these more or less unknown quantities together, which we will call x, y, and z, we get P, the picture. Now for our argument, it is most significant to note that of these three the only necessary factor, without which is nothing, is z. $x\,z$ produces a very fair result which, taking some liberty with algebraic methods, we may conveniently call $P - y$; and again, $y\,z$ is the usual painting to be met with in most studios or exhibitions—viz., $P - x$; but, as already said, $x\,y$—that is, $P - z$—is simply a minus quantity.

The above obliges us to conclude that the essential foundation

of every work of art is the exemplification of some arrangement of truth or fact. I here want to insist that in this one particular photography is far and away in front of all other graphic processes. I know well enough that it is the fashion to cite bad photographs and argue that photography is utterly false. I know that the habitual exaggeration of nature by painters has led certain people to assert that photographs are not only wrong in tone, but are, use what lens you will, distorted in form. I also bear in mind Mr. H. P. Robinson's only half-seriously meant paradoxes, read at the Camera Club Conference, in which he, however, says: "Its (photography's) one great deviation from faultless virtue is . . . that it is more truthful than painting." But we may, without fearing contradiction from those who are serious and unbiassed, safely conclude that the sum of the facts of nature included in a landscape photograph of the best quality is generally greater than in the case of a painting.

Witness Dr. Emerson: "One of us—an accomplished landscape painter—has been drawing the scene in black and white . . . and his proportions and tonality are altogether different from those of your photograph."

All this, if it mean anything, implies that the painter-artist sacrifices truth to effect,—draws a mountain side which really makes an angle of 30°, with the horizon at some angle nearer 90°, and alters the "tonality" not so much by reference to the scene or meteorological phase he is depicting, but to suit his own convenience and fit in with his fancy. Thus, apart from the exigencies of composition, colour blindness, short sightedness, biliary, or one of a score of other chronic diseases may, and frequently does, cause him to see things not only as they are not, but as most other people do not see them, and do not wish to see them.

Finally, however much the painting may differ from the photograph the two may in many respects agree quite as much as do the works of different artists one from another. Consider for a moment the views of Venice painted by, say, Canaletto, Turner, Stanfield, C. Montalba, and others, and you will quickly arrive at

a realisation of how little constant veracity there must be in the works of either. A few outlines which inform us that "this is the Queen of the Adriatic" is almost all that there is in common between the views of, say, Canaletto and Montalba.

Assuming, then, as I think we have a full right to do, that photography is a more accurate translator of nature's features, there remain for consideration the other two factors—*i.e.*, imagination and composition.

As regards the second of these the most ruthless vilifier of our Cinderella art must perforce admit that we have got some power to arrange a picture, inasmuch as in landscape the point of view, time of day and of year, atmospheric condition, employment of accessories, etc., etc., enable the operator to do a good deal towards modifying the lines and the tones of his subject.

The remaining factor, namely imagination, is no doubt the most difficult one to introduce into a photograph, but, as already said, even real artists,—I mean those who may lawfully clothe themselves in wideawakes and velvet coats,—do not usually introduce any measurable quantity of this heaven-inspired quality into their work. Not that imagination is always quite absent in the best photographic productions: without stopping to consider what *in excelsis* exhibits this precious attribute, let the reader think of "Carolling" or "Sleepy Hollow" or "The Knight," the latter by Burchett, and then say is there no imagination in these? Do they not, and "forty score more," exemplify the imagination to conceive and the wit to carry out?

The foregoing considerations are surely sufficient for the "ninety and nine" to agree that the factors *x*, *y*, and *z*, which are necessary elements of a work of high art, are all of them present in photography of the highest grade, and, moreover, their product is in some cases greater with the camera than with the brush and palette. It does not of course follow that the factors are in each case of the same relative value; but just as 2×10 is no more than 5×4, so a large amount of truth multiplied by smaller amounts of imagination and composition may in a sense be quite

equal to a larger proportion of these last multiplied by a smaller value of truth.

Here, with the reader's permission, I should like to hark back for a moment and add a few words respecting the amount of realism contained in a painting and in a photograph respectively.

So much has of late been written about false colour rendering, false sky and water, false distances and foregrounds, that nothing true (as regards tonality) seems left to us but a scrap or so of middle distance. If all such technical defects, and others not above enumerated, were proven up to the very hilt, *which they are not*, how much perversion of nature do we not find amongst painters! Bearing in mind what I have written on this point (see *ante*), is not in their case perversion the rule and correct rendering the rarity? I ask this in no carping or offensive spirit, all I mean is that in many instances painters do not accurately record nature's aspects in their pictures: besides those who, from want of ability, cannot render things as they are, many deliberately reject the unvarnished truth and prefer to paint a, perchance, sublime unreality.

The self-appointed censors and castigators of photographic art seem to ignore or forget that in the camp of the painters there is no fixed standard to which all productions can be referred. Quite the contrary; for any one possessing suitable culture and sufficient leisure could arrange a series of landscapes having at one extreme a Brett-like literalism, and at the other a conventionalism which little more than symbolises a few scenic features. Here let me emphasise the significance of the circumstance that the art of painting has gradually evolved from a state of symbolism to one of realism. In England within the past century a great deal of landscape detail was made up of little more than hieroglyphic. Many objects were treated in a traditional fashion, and the beholder was expected to know what they stood for. Thus trees were little better than toys, and meads a mockery: all this not because a nearer approach to form and colour was bad in art, but because painters had not learnt to see; and yet who, living a hundred years ago, pointing out all this false muddle which was

then our best, would have been heeded? In so far as we are in advance of the last so are we possibly behind the next century in the appreciation of strict accuracy of rendering by painters. But, be that as it may, inasmuch as there still remains a large leaven of conventionalism in the works of our latter-day artists, to that extent is there a departure from fact; a sometimes conscious but often unconscious *suppressio veri.*

In their striving to smother any defence which may be raised, the assailants of the art-science (if I may be allowed the term) have endeavoured to restrict their animadversions to those who practise "pure" photography. What they mean I don't quite know; and whether in the abstract so called pure photography, if possible, is a good thing I here give no opinion: sufficient for my present purpose that it does not exist.

Dr. Emerson, in the January number of this journal, insists that, the camera being properly focussed and *in situ*, "'taking' the picture is a pure science, as for ever proved by Messrs. Hurter & Driffield."

That these two erudite theorisers have converted Dr. Emerson, and also many other distinguished and undistinguished amateurs, cannot be gainsaid; but nevertheless a vast number of those who lavish time and employ dexterity in the production of negatives do not accept the more or less hypothetical conclusions of the aforesaid investigators.

It may be true that, if you get the right exposure, a normal development will always produce a normal result. But what is the right exposure? Messrs. Hurter & Driffield's tables certainly do not tell us, any more than will so-called winning systems indicate how to infallibly break the Monte Carlo bank.

The exposure tables tell us, more or less accurately, certain things of which we might at times be heedless or doubtful, but they will not inform us what part of a scene we should emphasise, what tone down. Will they tell when we should sacrifice our shadows for the sake of our sky; or answer a multitude of cognate questions? Certainly not. There is, I maintain, no absolute

standard of correct exposure, because in every outdoor scene something has to be abandoned, and on that something depends the exposure.

As for the immutability of development, I challenge those who believe in it to produce six individuals who turn out the best class of work, and who would be content to use a developer of fixed composition and temperature, and apply it for a fixed time. If this cannot be done, what becomes of the new-fangled doctrine? No one who has mixed much with workers but is well aware that there exists an almost complete consensus that they are very much able to affect the character of the negative by the manner in which they develop it.

If then *ab initio*, as it were, human control and intervention affect the result, pure photography, that is, wholly and entirely mechanical photography, does not exist. Even the penny-in-the-slot abortions required a skilled nurse to watch over their delivery.

I don't assert that an automaton cannot expose and develop any more than that a walking man is an impossible mechanical feat. But is there, therefore, no grace, no art, in a minuet or saraband? Do talking dolls detract from the claim of oratory to be called an art?

The blind working of chemical laws in the production of a negative may be vastly valuable and interesting to the man of science, or to such as desire to apply photography to the unimpassioned observation or registration of phenomena or objects; but to those who aim at picture making, and who use the art-science as a servant to obtain artistic results, it is quite immaterial whether their work is called pure or adulterated, unless indeed, being "medal collectors," they stand in dire fear of irresponsible exhibition committees, who, for the benefit of the genus "duffer," often draw up Draconic rules for the prevention of any form of what they call "tampering." But apart from such, and apart from the smaller fry who are content to use the camera much as their congeners who play "bumble puppy" do the "solace of old age," let us consider what there is, over and above those personal

elements already spoken of, which may perchance enter into the production of an art-pervaded photograph.

For brevity's sake I tabulate some of the present possibilities, the successful use of which depends more or less on the exercise of a judgment fortified by artistic culture.

(1) The wise choice of lens and stop.

(2) The employment or not of orthochromatic plates.

(3) The use or disuse of colour screens and of polarised light.

(4) The use of various forms of shutters and shades.

(5) Selective and directive development by which the tonality of parts may be relatively altered.

(6) The power of reducing and intensifying applied to whole or parts of negative.[1]

(7) Sunning and shading during printing, also masking.

(8) Double printing: especially cloud printing.

(9) Retouching, erasing and painting or staining negative.

(10) Local development in printing (where the process used permits).

(11) The choice of paper to print upon and of the tone of the picture.

(12) The application of paint, pencil, or other pigment to the print in order to reinforce the effect aimed at.

I do not give the above as a complete statement of our powers of control, but it is more than enough for my present contention.

It is, of course, quite open to some irreproachables to abstain from any or all the means indicated for obtaining wished-for results, but it is to be hoped that none will therefore decry works so produced.

If they do,—that is to say if they object to any exercise whatever of the elective and selective faculties,—how will they reconcile such objection to an operation like bromide-printing?

To cite an example: a worker, known to the writer, having a

[1] Those who have not already done so should read Mr. Hodges' article on this point in the April number of this journal.—H.M.

negative of great promise, decided to get the best print possible for exhibition purposes. A first trial was decidedly disappointing in result, but by dint of long and intelligent applications of the various modifying influences available (intensity and distance of light, length of exposure, variations in composition of developer, use of slow and quick paper, shading, local development, etc.) eventually obtained a print which satisfied him—and his judges. Here is a distinct case of human intelligence affecting the resulting print, and, perhaps, with the exception of local development, the influence is not only warrantable by the greatest stickler for purity, but is inevitable. In the case above cited quite two score prints were made before the wished-for result was attained, and each particular print differed in some degree from the others.

The acquirement of photography is like learning to write: the schoolmaster, as in duty bound, praises the clear, bold penmanship, and in similar fashion does the photographic pedagogue magnify the virtue of the immaculate negative. But after all it is not the legibility of the autograph but the use we make of it which is laudable, else would the typewriter eclipse Milton. So with photography, it matters but little to the picture-maker how he employs it so long as he can make it tell the story he wishes it to.

The astronomer wants undiluted actuality, the photographic scientist yearns for the perfection of technique, but the man of art only cares for the thing of beauty. Why should he not get it how he is best able? Doubtless some practitioners of the old school will shake their heads at such heresy, but there is no doubt that this helping forward towards pictorial perfection is being more and more practised by photographic pioneers. This, as it were, goading of negatives to do more than they are naturally disposed no doubt costs some of us a more than passing pang; in the words of Coventry Patmore:—

> "To 'ave to wop the donkeys so
> 'Ardens the 'art, but they won't go
> Without!"

The fertile subject opened out cannot on this occasion be fully discussed, but it would not be well to leave the question without saying that few, if any, medalled works are produced which do not depend almost entirely upon the personal element infused into the resulting print. If any of this infusion of personality be reprehensible, certainly the form most frequently and, apart from master works, most disastrously used is the least defensible; I mean the printing in of clouds. Many of the most notorious *chef-d'œuvres* depend entirely for their attraction upon this expedient. Not only are these skies frequently first in quality, but also in quantity, often monopolising two-thirds of the print. So much do they sometimes dominate the small strip of earth or water over which they are stuck, that they should be rather classed as studies of atmosphere than of landscape.

Do not misunderstand me. I, personally, do not in the least object to cloud-printing; if nothing else, it helps to sort out the sheep from the goats, the dense from the divine, as any observant student of nature must know who has seen some of the astoundingly incongruous combinations which are sometimes innocently exhibited by various individuals.

No, what I hold is, one should not swallow the camel—printing in sky—and strain at the gnat—viz., the other expedients referred to, *ante*.

The doctrine that a good photograph is not an art production might be answered by asking, Why, then, can so many people easily and plainly show in the finished print that they are art-ignorant?

But, leaving the weaklings, after all the most complete reply to the aspersions of photography's detractors is to point to the productions of our best men. Do not the finished works of a goodly few show that they are the outcome of an intelligent direction of a means to an end? And is not this so because the worker is by training and instinct in the best sense of the word an artist?

Take the best samples of Mr. Van der Weyde's creations. Is it not incontestable that were he not a sterling artist these could never have been composed and completed? If that, which for its

production needs an artist, be not an art product, what else shall we call it?

I know all photography does not exemplify culture, that is beside the question, for all painting is no better off, or the coloured figures in Skelton's Theatre, so dear to childhood in the "fifties," would claim kindred with the sublimities of Burne Jones, or Millais.

But is there no applied art in the photographic works of H. P. Robinson? Yea, and of the best kind too. Are Burchett and H. Hinton, or Gale and Davison not able to put art into their prints? Is it but pure luck that gave us "Eventide," or "Sand Dunes," or Mrs. Cameron's "Thomas Carlyle"? Certainly not. That the works of some are uniformly bad, and of others unfailingly good, speaks for itself. The difference is in the man.

The man it is who selects and arranges the innumerable words with which Mother Nature is at all times speaking to us; he, and not blind chance, it is who composes the story, and bids our Cinderella tell it, in his language, to the world.

I trust that the few remarks I have made on this not unimportant question will serve to reassure some of those who have been rather scared by the big, bold, bad things which have been, I think, so recklessly written. If, however, I have not succeeded in making out an overwhelmingly strong *primâ facie* case for the defence, amateurs must not forget that Cinderella is still but young. Small doubt but that Time, the fertile mother of Invention, Discovery, and Improvement, will, by the aid of these her children, in due course remove some of the obstacles which at present stand in the way of artistic photography. Till then say I with Mr. W. Morris:—"Patience and prudence must not be lacking to us, *but courage still less.* Let us be a Gideon's band." Whosoever is fearful and afraid, let him return and depart early from Mount Gilead.

HECTOR MACLEAN.

A RECENT IMPROVEMENT IN THE MANUFACTURE OF OXYGEN GAS.

OF all the elementary substances with which chemists are familiar, oxygen is the most abundant. The solid portions of the globe we inhabit contain 50 per cent. of it, the air we breathe contains 23 per cent. of it, and nearly 90 per cent. of the water we drink is oxygen. It is not astonishing that a substance present everywhere in such large quantities should have engaged the attention of theoretical and practical chemists almost from the dawn of the science.

Discovered by Priestley in 1774, and named by him dephlogisticated air, the gas was soon after renamed by Lavoisier, and became in the hands of the latter chemist the chief means of overthrowing the theory of phlogiston, and of establishing on a firm basis the science of chemistry.

In our own matter-of-fact days we have put this gas to many practical uses, which, as the cost of producing it decreases, will doubtless multiply a hundredfold.

As all lanternists are aware, burning coal gas, mixed with oxygen instead of air to aid its combustion, gives an intense light when caused to impinge upon a cylinder of lime, the intense light being the result of the very high temperature to which the flame raises the refractory lime. The same hot flame is used for brazing and welding metallic substances, being hotter, more convenient, and cleaner than the old coal gas and air flame, which it must eventually supplant. The same flame is used for melting platinum, and nothing but the cost of the oxygen has hitherto prevented it from being used in the extraction of iron, copper, and other metals from their ores.

A small quantity of oxygen introduced into coal gas of poor

quality, intended for illuminating purposes, has been found to materially enhance the brilliancy of the light; whilst, used in conjunction with bleaching lime in the process of paper-making, it accelerates the action of the latter in decolourising the paper pulp.

No less noteworthy are the results which have been obtained in the treatment of certain pulmonary diseases by causing the patient to respire air containing more than its normal amount of the gas.

In view of all these practical applications it will be interesting to pass, in review, some of the means of producing this gas in quantity. Seeing that the solid portions of the globe contain oxygen in abundance, this might appear at first sight to constitute a cheap source of supply; but, unfortunately, no process has yet been devised to separate the oxygen from the other elements with which it is combined.

Water, again, seems to be a promising material to operate upon; but in this case we have also to contend with the difficulty that in water, as in solid earth, the oxygen is in chemical combination with something else, to separate it from which requires the expenditure of a large amount of energy.

It is true that an electric current will decompose water and yield the oxygen in a pure state, but the cost of producing the current itself is, at present, much too high to render this method of any practical value.

There remains, then, the atmosphere, in which, moreover, the oxygen is no longer in chemical combination, but merely mechanically mixed with nitrogen, carbon dioxide, aqueous vapour, and traces of certain other substances.

Graham showed, many years ago, that a partial separation of oxygen and nitrogen could be effected by taking advantage of the different rates at which these gases will pass through caoutchouc, the oxygen passing through about twice as rapidly as the nitrogen. Owing, however, to the incomplete separation of the gases Graham's process is of little commercial value.

Far more promising are those processes depending upon the fact that certain substances at a certain temperature absorb oxygen

and not nitrogen, and give off this oxygen when the temperature is somewhat raised. Thus baryta heated to dull redness in presence of air becomes converted into barium peroxide, a substance containing twice as much oxygen as baryta; and this barium peroxide when heated to full redness gives off the oxygen it had previously absorbed, becoming reconverted into baryta. Or, instead of alternately raising and lowering the temperature, we may, instead, keep the temperature constant and force air under pressure over the baryta, and so convert it into barium peroxide, and then place the latter in a vacuum and so deprive it of the oxygen it had absorbed.

Being given, then, a properly arranged retort containing baryta—and it should be possible to obtain a continuous supply of oxygen from the air, and such a process slightly modified in detail has been worked commercially for many years—there are, however, several objections to the baryta process which materially raise the cost of the oxygen produced by this means.

Baryta is, in fact, a substance extremely prone to absorb moisture from the air, this moisture causing it to cake together and become a firm, compact mass, although originally it may have been quite porous. Now if the baryta is porous it is in the best condition for absorbing the atmospheric oxygen, for then only can the air have access to every part of it. When clotted together the outer portions only are available, with the result that the output in a given time becomes greatly diminished. To prevent this clotting together of the baryta special precautions have to be taken to dry the air before permitting it to enter the retorts.

Quite recently Mr. J. H. Parkinson, of Stretford, Lancashire, has substituted for the baryta a mixture of potassium permanganate and white clay, a mixture which possesses the great advantage of being practically unaffected by moisture, whilst it absorbs oxygen under increased pressure and gives it off under diminished pressure. In the process as carried out by Mr. Parkinson, the permanganate mixture is placed in large retorts, holding about half a ton, suspended from the roof of a gas furnace, each retort being

shaped like a V, so as to ensure the thorough heating of the contents.

On the top of the furnace are the compressing and vacuum pumps. Five retorts are used, one being employed as a superheater to raise the temperature of the compressed air, the remaining two pairs being alternately connected to the compressing and vacuum pumps.

To begin working the air is driven by the compressing pumps through lime to deprive it of carbon dioxide and of any traces of acids which it might contain ; next, through caustic soda to deprive it of oily matter contracted by passing through the pumps ; and, finally, through the superheater, on emerging from which it passes into the retort containing the heated permanganate mixture. After five minutes' sojourn therein this retort is opened to permit the nitrogen to escape, then closed again, and connected with the vacuum pumps which deprive the permanganate of its oxygen and deliver this gas into a suitable receptacle. A valve automatically directs all these motions, the compressing pumps being connected to one pair of cylinders whilst the vacuum pumps are exhausting the other pair, and in this way the supply of oxygen is kept practically continuous.

To show the value of Mr. Parkinson's improvements, it is only necessary to mention that oxygen can be made by his process at the very low cost of 1*s.* 6*d.* per thousand cubic feet.

CLEMENT J. LEAPER, F.C.S.

SOME LANDSCAPE DIFFICULTIES.

IT is generally conceded that a very large proportion of amateur photographers are more or less pure landscapists; nor is this a matter of surprise, as there are few more satisfactory ways of enjoying a holiday than to bring back sketches or photographs of the places we have visited, so as to be able to recall them at any future time. To be able to do this in an efficient manner, it is necessary that we should make the photographs or sketches ourselves, as by that means they become, so to say, almost an integral part of our own nature, and are thus able to give that extra pleasure which is denied to those who trust to purchasing them.

Sketching is probably the most satisfactory way of working; but then it requires much time, and a practical knowledge of drawing and colour. As these are not always available, it is no wonder that there are so many photographers, especially when it is remembered that by means of dry plates a large number of views can be taken during a holiday and developed at one's leisure afterwards; also that by means of the camera various scenes can be taken, many of which are very difficult, if not in some cases impossible, to draw.

After the novelty of taking promiscuous views has worn off, the man whose soul is in his work desires to be something more than what has been well named a "topographical photographer," however useful such a form of photography may be, and wishes to embody something of his own views of nature in his photographs; in fact, he wants to pass from the photographer to the artist. It has often been stated that this is impossible, and that photography is mechanical, and must ever remain so. A few visits, however, to exhibitions will soon dispel this fallacy, as in them it is easy to

pick out the work of different men, just as one can do in an ordinary picture gallery, thereby showing that something of the operator must have passed into his work. Naturally he cannot show as much individuality as the artist, for the lens will always depict what is before it; but this only means that the camera has more limitations than the brush. On the other hand, to the earnest student of nature the photographic print often shows serious defects which are not so evident in the image on the ground glass. Some think that photography in colours would get rid of this difficulty; but whether this is so or not, our present photographs are taken in monochrome, and it seems to me that our wisest course at present is to see in what direction we must investigate in order to improve our present monochrome rendering, and to give our prints more of the qualities of a good drawing.

Photographers are very apt to fail in the quality that artists call "breadth"—that is to say, the repose and mystery of their shadows are injured by a large number of scattered bright lights. The usual way of modifying the brilliancy of these lights is by sunning down; but this process has the defect of darkening the shadows at the same time, so where this is objectionable they must either be left or else carefully retouched, which is rather a laborious piece of work. It, therefore, would be better, if possible, to get the camera to do the work. At the first blush this would seem to be an Utopian idea; but I think that in many cases the properties of polarised light can assist us over this difficulty. The theory of polarised light is too long to explain here, and must be looked for in works on optics; sufficient of the practical part for our purpose can be given.

If an object is viewed through a crystal of Iceland spar, it will be remarked that the image is, as a rule, doubled, and one image can be made to rotate round the other. If, however, the rhomboid of spar be cut through from obtuse angle to obtuse angle, and recemented in the same position by means of Canada balsam, it will give only a single image, the other one being reflected by the balsam out of the field of view. A crystal thus cemented is

known as a "Nicol's prism," and the light passing through it is in the condition known as "polarised." If now a second Nicol's prism is held in the same position as the first, between it and the eye, the light still passes through both apparently unaltered. If, however, the second or first prism is rotated, the light will decrease in intensity till the two crystals are at right angles to each other, when the light will not pass through; and, in fact, in this position two well-made prisms are opaque to the strongest sunlight. As the prism is still further rotated the light reappears, till they are at 180°, when all the light will pass through, and so on.

Now, light reflected from leaves or other polished surfaces is, as a rule, partially polarised—that is to say, part is ordinary light and part polarised light, and the latter can be extinguished, either partially or wholly, by means of a Nicol's prism put in the right position; this can be easily seen by looking at polished leaves, such as ivy in sunlight, through a Nicol's prism, when the prism is at right angles to the plane * of polarised light; the grey reflections will be almost totally extinguished, and the green local colour will appear.

On investigating our landscape, it will be observed that the lights which are giving us so much trouble come from bright, reflecting substances, such as leaves, so we have by this method a mode of modifying their reflections to the amount of brilliancy we require, as it is self-evident that there is no need to totally extinguish the reflected light. Again, a most troublesome object is a roof, which, owing to the same reflected light, will persist in photographing as though it was only slightly darker than the sky; by the same means we can get rid of the troublesome reflection, and so on in all similar cases. Another example is in photographing clouds, for the blue of the sky is also as a rule partially polarised, and this light can be modified in the same manner; in fact, in this case the process is used, though I doubt whether the reason is

* This word is used for clearness, but there is some uncertainty about the position of the plane of vibrations.—J. G. P. V.

generally known, for it is recommended to photograph clouds by means of a black mirror, and such a mirror is a most efficient way of obtaining polarised light, the mirror replacing the Nicol's prism, though the reduction of the intensity of the illumination may also assist the exposure. I have been unable to make the complete series of experiments I meant to in this matter, as I was prevented last year by a long illness and this year by the very late spring. However, as far as I can see, the best position for the prism is where the stop is usually placed; and, in fact, it acts as a stop itself, its aperture being about one-third of the length of the prism, so probably a smaller stop would not be required; but if so, a stop is easily attached to the prism. If it is used with a double lens, it would either have to be mounted in a revolving fitting like that used in microscopes, or else the lens would have to be rotated. A slight unscrewing of the lens would probably answer in most cases, or else one of the iris lens adapters might be used. With a single lens one of the ordinary substage polariscopes used with microscopes could be fitted to one of the stops; and as these prisms are already mounted in a rotating fitting, there would be nothing else to do. The price of Nicol's prisms mounted for the microscope runs from fifteen shillings up, according to size, but one of the large ones would hardly be required for ordinary work. As the amount of polarised light reflected from an object depends on the refractive index of the surface, and also on the angle it makes with the source of light, it is evident that this method will not get over all difficulties of reflection, though it can help to modify them; and we must make in this, as in any other photographic process, the best compromise we can.

Another point which gives great trouble is the different way photographic plates render colour to that which the eye does; in fact, so much is this the case that at present there are views which are almost impossible to photograph. Orthochromatic photography, that is to say, dyed plates, are as yet the only way we know of out of this difficulty, and by their intelligent use much can be done, and satisfactory results can be got, by the help of proper screens,

where formerly success was very difficult, if not impossible. In fact, now some of the copies of pictures are so good that it is hard to believe that the work has been done by photography. So that we may now look forward with confidence to being on the right road to overcome this difficulty.

Coloured screens are also useful with ordinary plates, though the results are certainly better with dyed plates. My experiments in this matter point to a deeper screen being required for an ordinary plate than that required for an orthochromatic one, in order to get approximately the same result; but this might vary with a different brand of plate. Involved with this subject is the fact that different parts of a view require different exposures; the result is, when one part is fully exposed another is over-exposed, and thus the resulting picture is apt to be false in colour rendering and tone, though luckily it is the parts which can stand this best which, as a rule, suffer most.

To counterbalance this defect a new plate has just been brought out, which is covered with either two or three different rapidities of emulsion, so that it is not easy to over-expose in the same manner, because when the upper rapid emulsion is over-exposed and gets thin, the under less rapid layer takes up the exposure. The plate is Thomas "Sandell" plate, and the specimens exhibited certainly seem to show that a valuable power resides in this principle. As the plate is, however, new, it has yet to go through practical experience.

The two defects above referred to are not so evident in a photograph taken with a pinhole; for from the general out-of-focus state of the picture, the small scattered lights are softened away; also it will be remarked that the colour rendering is inclined to be a little better. The cause of this I believe to be that the different coloured images of the view are the same size on the plate, and do not overlap each other; whereas in an ordinary achromatic lens the images of the rays, for which it is corrected, are the same size, but the other rays are inclined to give images which are not exactly in focus, and so are of a different size. Now, how-

ever, lenses are being produced by means of the new Jena glass in which three rays are combined, and by this means the residuary images are of very small importance. For instance, I looked at the specimen photographs taken with Ross's new concentric lens, and it seems to me to render the valves as well as the pinhole—without, of course, the blur of that optical appliance.

There is another difference between photographs and pictures, and that is that the latter, if good, possess almost always what artists call a "focus"—that is to say, that the motive of the picture, be it a ruin, waterfall, or whatever else, is worked up carefully, and everything else is kept subordinate to it, with the result that the observer sees the view as the artist wishes it to be seen, and the eye is kept from wandering over the picture : the rationale of this is that the human eye only sees one object distinctly at a time, the other objects being recognised only. This quality is, I am afraid, beyond the power of the camera in most cases, and can only be obtained by retouching, masking, etc. The great advantage of it is well seen by comparing a photograph of a picture with an ordinary photograph direct from nature. The principle is also utilised in the backgrounds of the ordinary portrait photograph.

The pursuit of rendering photographs more artistic is a very pleasant and engrossing one, as we are always learning something new, and thus get a fair share of the enjoyment which is generally supposed to belong to artists alone. On the other hand, it is difficult, and requires much study, for we must be quite sure of the effect we wish to produce before uncapping the lens, because it is easy, either by suppressing lights, or by using a wrong coloured screen, to entirely destroy the true effect. The simplest way of acquiring the necessary knowledge to avoid doing this is by availing ourselves of the knowledge acquired during the course of centuries by the older art of drawing. To acquire this it is wise to avail ourselves of every opportunity of studying pictures, both bad and good, for by so doing we shall know what to copy and what to avoid.

A very useful thing, if we can do it, is to study the works of

one mature artist, and to see how he has modified his earlier works as his knowledge of picture-making increased. This course is rather mortifying to our self-satisfaction, as we shall soon see how like the earlier student work, in its want of breadth, hardness of details, and lack of artistic focus, is to a photograph; but this just shows its utility.

The camera is not as flexible as the brush, and some of the most sympathetic moods of nature are, and I am afraid will ever be, beyond its reach. On the other hand, its drawing is careful and exact, so what is lost on one hand is gained on the other. Materials for photography have steadily improved, new modes of working are continually being invented, knowledge has steadily increased, and the result is that photographs are now much more satisfactory, and better than they were formerly. For copying work the camera is fast replacing all other methods; it has almost superseded all other ways for magic-lantern slide-making, and it is still steadily advancing, and, judging from its past history, we may safely assume that it has a yet more brilliant future before it; and I trust that the foregoing remarks may prove of service in overcoming some of the difficulties of landscape photography.

J. G. P. VEREKER.

NOTES.

OUR frontispiece is a reproduction in Woodburygravure by the Woodburytype Company of a study by Mrs. S. Francis Clarke, of Louth, who is well known for her work in this particular branch of photography.

With regard to the frontispiece in our last number, this was reproduced by Messrs. Waterlow & Sons, and was a fine example of Woodbury printing, which was by error ascribed to the Woodburytype Company.

Probably the sensation of the last quarter has been Mr. F. E. Ives', of Philadelphia, demonstration and lecture on "Composite Heliochromy," which is fully explained by the following lecture delivered by him before the Society of Arts.

"Most people look to original discovery for the solution of photographic problems, and most photographical problems are solved by original discovery. There have been a few important exceptions to the rule. The production of the so-called half-tone photographic block—the latest substitute for wood engraving—now grown to a very important industry, is one example. The first practical solution of this problem—a process which I patented in America, in 1881—was a purely mechanical invention, utilising photographic processes already known. The so-called Woodburytype process is another purely mechanical invention, based upon well-known photographic processes. The method of colour photography, which I have named composite heliochromy, and which the French prefer to call photochromy or composite photochromy, is also an invention, utilising comparatively old and well-known photographic processes. It is not a simple invention, but comprises several inventions by different men. The original suggestion was made twenty-seven years ago by her Majesty the Queen's painting master, Henry Collen.[1] Briefly stated, Collen's idea was to make three negatives of an object, one by red light, one by yellow, one by blue—the so-called primary colours of Brewster—to print from each pair of these negatives (superposed as one) a transparent positive having the colour (in the shadows) of the light that produced the third negative, and to superpose these coloured positives on a white surface. A Baron Ransonnet, of Austria, is credited with the same suggestion in the same year, but I have not the reference.

"It was not possible to carry out Collen's suggestion at that time, because there was no known process by which photographic plates could be made sensitive to the separate single colours only; and no photographic plates were

[1] *British Journal of Photography*, October 27, 1865, p. 547.

sensitive enough to red and yellow to admit of the production of such negatives by exposure through selective colour screens. Had it been possible to carry it out, the results must have been very imperfect, not only because the entire procedure is based upon a false and misleading theory of colour, but also because superposing two negatives to act as one would double the intensity of such parts as represented white, grey, or pale coloured objects, with the result that if the colour prints were made to show all the details of the negatives, the finished heliochromes would show all bright colours as if mixed with equal parts of black pigment.

"On November 23, 1868, Ducos Duhauron, of Paris, applied for a patent[1] for a process which differed from Collen's only in the manner of carrying out the same idea. Like Collen, he assumed that the spectrum is made up of three primary colour rays and mixtures thereof. He said, 'My procedure rests on the principle that the simple colours are limited to three—the red, the yellow, and the blue—the combination of which, in divers proportions, produces the infinite variety of shades in nature.' Like Collen, he expected to solve the problem by superposing red, yellow, and blue prints from negatives made by yellow and blue, red and blue, and yellow and red light. But instead of using plates sensitive to simple colours only, he proposed to use plates sensitive to all colours, and to prevent the action of colour rays not wanted by filtering them out with coloured glasses placed in front of the sensitive plates; and, instead of superposing two negatives to act as one to make a colour print from, he proposed to make two colours (that is, two-thirds of the spectrum) act to produce each negative, which amounts to the same thing. He proposed to make one negative through an 'orange' screen, calculated to absorb the blue light and transmit the red and yellow; one through a 'violet' screen, calculated to absorb the yellow light and transmit the red and blue; one through a 'green' screen, calculated to absorb the red light and transmit the yellow and blue.

"It was no more possible to carry out this idea in Duhauron's way in 1868 than to carry it out in Collen's way in 1865, although Duhauron, having succeeded in making photographs by exposing ordinary photographic sensitive plates through glasses that were orange, green, and violet to the eye, imagined that he had succeeded in carrying it out. In reality, the photograph made through an 'orange' screen must have been made chiefly by either the green, the yellow-green, or the ultra-violet spectrum rays, as can readily be proved by photographing the spectrum itself through a bright orange screen (not an orange-red one), on such a plate as he used. The photograph made through a 'green' screen, that transmitted freely both the yellow and the blue rays, must have been made chiefly by the blue rays, and the photograph made through a 'violet' screen must have been made without any action by the red rays, and with a great deal by the invisible ultra-violet rays.

"Soon after Duhauron published the details of his process, Charles Cros, of Paris, published another modification of Collen's idea.[2] Like Collen, Cros

[1] Class xviii., sec. 3, serial No. 83,061.

[2] Described in *Photographic News*, October 1869, p. 483.

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"The principle of colour selection advocated by Duhauron is identical with that distinctly proposed by Collen, to whom alone the credit of the original invention appears to belong; but Duhauron and Cros, besides proposing a more reasonable plan for obtaining the negatives, further suggested that optical superposition of positive images from the three negatives might be substituted for the superposition of transparent coloured prints.

"On December 3, 1869, M. Poirée, of Paris, in a communication to the Photographic Society of France,[1] suggested that better results might be had by making a greater number of negatives—a separate negative for each spectrum region.

"In 1873, Dr. H. W. Vogel, of Berlin, discovered that bromide of silver can be made sensitive to the less refrangible spectrum rays by treatment with certain dyes; and this, with the subsequent discovery of other and better colour sensitisers, supplied the means for carrying out either Collen's or Poirée's idea. Duhauron, one of the first to avail himself of these discoveries, made some practical progress, and, in 1876, abandoned Brewster's colour theory and patented a modified process,[2] based upon the observation that, while there appeared to be 'seven' principal spectrum colours, three colouring substances would 'serve to express them.' The colouring substances he named for this purpose are blue, carmine, and yellow; and he decided that, in order to make such a process reproduce the colours of nature, the negatives should still be made through orange, green, and violet glasses.

"At this period, Duhauron's orange-screen negatives were made on chlorophyl plates, and must have been made chiefly by the red spectrum rays. In 1878,[3] he announced that he had substituted eosine for chlorophyl, so that he must finally have made them chiefly by the greenish-yellow spectrum rays. The significance of this fact has not been generally recognised. The production of three negatives, one through an 'orange' screen, one through a 'green' screen, and one through a 'violet' screen, is a very indefinite procedure. A negative may be made through an 'orange' screen chiefly by the action of red rays, or orange rays, or yellow rays, or yellow-green rays, or green rays, or ultra-violet rays, according to the character and intensity of the 'orange'

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[2] British patent, July 22, 1876, No. 2973.
[3] "Traité Pratique de Photographie des Couleurs," Paris 1878; *Photographic News*, 1878, p. 115.

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colour of the screen and the method of sensitising the photographic plate for colour. Duhauron, who never recognised the necessity of testing his process by photographing the spectrum itself, not only did not find out what it is necessary to do in order accurately to reproduce the natural colours, but at different times he did very different and inconsistent things without himself knowing that he did so. The facts can very readily be demonstrated by first showing the spectrum absorption of various 'orange,' 'green,' and 'violet' screens, and then photographs of the spectrum which have been made on plates differently sensitised for colour. I shall now proceed to demonstrate this point.

"In 1879, Cros[1] also abandoned the idea that red, yellow, and blue are primary spectrum colours, but held that there are three primary spectrum colours and mixtures thereof, and that these primary colours are orange, green, and violet. Like Duhauron, he decided to make negatives through orange, green, and violet screens, and prints in blue, carmine, and yellow. Cros, like Duhauron, was apparently ignorant of the fact that very different negatives can be produced through one and the same screen, and he also allowed all of the invisible ultra-violet rays to act in producing the negative of the 'violet' screen.

"In 1885, Dr. H. W. Vogel[2] proposed to make the colour-prints with dyes identical in spectrum absorption with the colour-sensitisers employed in making the negatives. This does not amount to a principle of colour selection, because the entire spectrum can be photographed on plates sensitised with dyes that cannot be combined to reproduce some colours, and even without any dye at all, by the use of suitable colour-screens.

"Some time previous to 1889, I do not know the exact date, the Young-Helmholtz theory of colour vision was first recognised in connection with this subject, by Dr. F. Stolze, of Berlin.[3] He said, 'Although the colours correspond with certain external processes in nature, there is also no doubt that colour as such is nothing objective, but a subjective sensation, based upon the peculiar irritation of the visual nerves by those external proceedings. We can, therefore, only hope to produce a picture in natural colours, when we are enabled to reproduce upon the same the proceedings which furnish to us the colour impression.' 'Thomas Young . . . assumes that there are three kinds of nerve fibres, sensitive to red, green, and violet. Objective homogeneous light excites all three; but with red the first is excited strongly, the second and third weakly; with blue, the second and third moderately strong, the first weakly; with violet, finally, the third strongly, and the first and second weakly. If all three kinds of nerves are equally strongly excited, the impression of white light will take place.' Dr. Stolze suggested, but rather indefinitely, a procedure which, although not really representing the application of this theory, was more nearly consistent with it than were any of the older ones. The theory itself was defective as a basis of procedure, Clerk Maxwell having shown that the fundamental red sensation is not at all excited

[1] Bulletin of the French Photographic Society, 1879, p. 23.
[2] *Annalen der Physik* (N.S.), xxvii., p. 130; *Photo. News*, 1887, p. 568.
[3] *Anthony's Photographic Bulletin* (N.S.), 1888, pp. 516, 555, 588, 647, 678.

by the blue-green, blue and violet rays, the fundamental green sensation not at all by the red or violet rays, and the violet sensation not at all by the red, orange, or yellow rays.

"It was at this stage that, after ten years of experiment along the same lines as Duhauron, Cros, and Stolze, I myself made certain improvements, and claimed the credit of bringing order out of chaos, by devising a procedure which not only recognises the facts which support the modern colour theory, but which definitely represents the application of that theory.

"This process, although in a general way somewhat similar to those which preceded it, really represents a distinctly new principle, which is that of making three photographs by the action of light rays as they excite the three fundamental colour sensations, and superposing these photographs by means of lights or in transparent pigments which suitably represent the corresponding fundamental colour sensations.

"In February 1888, I demonstrated, at the Franklin Institute, Philadelphia,[1] a process in which the colour selection was according to a definite plan, and proved by photographing the spectrum itself, adjusting the colour screens to obtain definite density curves in the spectrum negative. This was the first publication in which a really definite mode of procedure was indicated; but it was not until November of the same year[2] that I demonstrated the method so modified as to definitely represent the application of the Young-Helmholtz colour theory, in accordance with Maxwell's measurements of the relative power of different spectrum rays to excite the respective fundamental colour sensations.

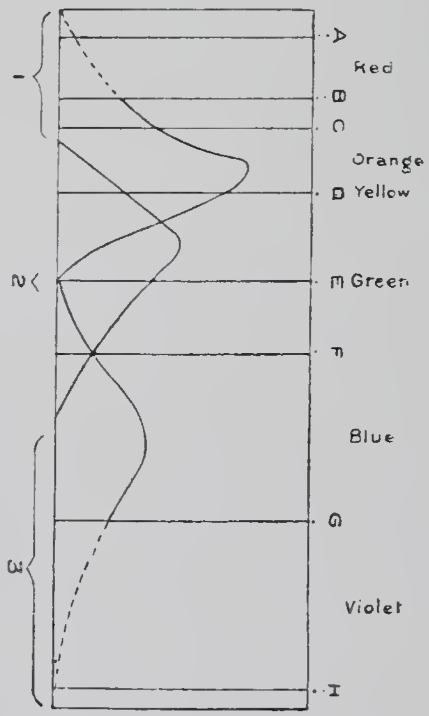
"A little study of Maxwell's diagram, showing the result of his measurements, will show that the application of this new principle involves very important departures from the older methods of procedure. In this diagram, which I reproduce, 1, 2, 3 are spectrum colours which represent fundamental colour sensations, because each excites one sensation only, and *a*, *b*, *c* are curves showing the relative power of different spectrum rays to excite the respective fundamental colour sensations.

"The first remarkable fact to be gathered from the study of this diagram is, that the rays which represent a fundamental colour sensation are in no case the ones that most powerfully excite that sensation. The red sensation is excited by all the spectrum rays from red to green, but most powerfully by the orange; and the negative to represent the effect upon the fundamental red sensation must therefore be made, not through a red glass, or by the red rays, but by the joint action (in definite proportions) of the red, orange, yellow, and yellow-green spectrum rays. The negative to represent the effect upon the green sensation must be made by the joint action of the orange, yellow, yellow-green, green, and green-blue spectrum rays, in proportion to their power to excite that sensation. The negative to represent the effect upon the blue-violet sensation must be made by the joint action of the blue-green, blue, and violet spectrum rays, in proportion to their power to excite that sensation.

[1] *Journal of the Franklin Institute*, cxxv. 345.
[2] *Journal of the Franklin Institute*, Jan. 1889.

"By photometric measurement of the density curve of a spectrum negative, the relative amount of action by the different spectrum rays may be found. It is, therefore, only necessary, in order to secure action by different rays in any definite proportions, to use such a combination of sensitive plate and colour screen as will yield a spectrum negative having a density curve corresponding to the graphic curve representing such proportionate action.

"Sensitive plates and colour screens that will yield three negatives of the spectrum, having density curves like the three graphic curves in Maxwell's diagram, will produce a permanent photographic record of the effect of light from any object upon the three fundamental colour sensations. This can most readily be accomplished (with separate plates) by exposing a cyanine-



stained rapid gelatino-bromide plate through a double screen of aniline yellow and chrysoidine orange, of suitable intensity, for the red sensation; a commercial 'orthochromatic' plate through a screen of 'brilliant' (aniline) yellow, of suitable intensity, for the green sensation; and an ordinary gelatine bromide plate through a very thin piece of plane-polished green glass for the blue-violet sensation. The screens that will secure the same results all on one kind of plate are far more complicated and difficult of adjustment; but any one who possesses a photo-spectrograph and a good assortment of coal-tar dyes can, by the exercise of some skill and ingenuity, make the adjustments for himself.

"The set of three photographs of any object, made as I have indicated, of course show no colour whatever; but they contain, in a permanent form, such a graphic record of the natural colours that, in order to reproduce them

to the eye, it is only necessary to superpose the three positive images, either upon a screen, or upon the retina of the eye—the one representing the red sensation with pure red light, the one representing the green sensation with pure green light, and the one representing the blue-violet sensation with blue-violet light. The blending of the three images will excite exactly the same sensations as the light coming directly to the eye from the object itself. The synthesis can also be made with superposed transparent colour-prints, and this is the plan which has received the most attention, although the simplicity of *optical* superposition commends it to scientists, and is really more convincing to everybody.

"Both Duhauron and Cros had the idea of synthesis by optical superposition as well as by colour-prints, but neither of them succeeded in carrying out the idea practically. Superposition by triple optical lantern projection was first carried out successfully by me, in my demonstration at the Franklin Institute, Philadelphia, in February, 1888, showing a landscape photographed from nature. I employed a single lantern-box, having three optical systems close together, with a triple limelight jet, and the three positives mounted side by side in a single wooden frame, behind red, green, and blue glasses. A considerable variety of subjects were shown with the same lantern in November of the same year, when I first clearly stated and demonstrated the principle which represents the application of the Young-Helmholtz-Maxwell colour theory.

"The first workable plan of optical superposition other than by lantern projection was devised by Antoine Hippolyte Cros, brother of Charles Cros, and patented in 1887. In this device, the three pictures are arranged relatively to each other like the steps of a staircase, and by means of a peculiar system of mirrors, some of which are attached to the face of a rapidly revolving wheel, with open spaces between them, the different pictures are seen by the eye in one optical plane, in such rapid succession, that they appear like a single picture, with colours blended. The same device, which is a very ingenious one, was to be used also for making the negatives; but it is so clumsy, so troublesome, by reason of the necessity for providing means to keep the mirrors in motion, and includes such an extremely narrow angle of view, that I believe it has no practical value.

"Both Duhauron and Cros taught that synthesis by optical superposition should be accomplished with the same mixtures of light rays that acted to produce the different negatives. The picture made through an orange screen was to be seen by the light transmitted by the same, or an exactly similar screen, and so on.

"I hope I have made it clear that such a procedure is quite irrational, in view of the facts which support the Young-Helmholtz-Maxwell colour theory. The photograph made by the joint action of various different colours of spectrum rays must be seen by rays of one colour only. Spectrum rays of various colours excite one fundamental sensation, but only spectrum rays of one single colour will serve to represent that fundamental sensation.

"I have taken particular pains to emphasise this fact in every paper I have

published upon this subject, but have not yet succeeded in impressing it upon the minds of the French writers, who continue to assert that my procedure does not differ in any essential particular from that indicated by Duhauron and Cros. I think that this one difference alone is of vital importance.

"The application of the Young-Helmholtz-Maxwell theory involves important changes from the older methods, not only in the negative process, and in the synthesis by optical superposition, but also in the production of permanent colour prints. Theoretical considerations alone led me to conclude that a transparent colour print from either negative could be made to perform exactly the same function that the positive transparency from the same negative performs in the synthesis of triple-lantern projection, and a simple experiment with the triple lantern confirms my conclusions.

"The white disk that we obtain in screen projection by mixing the red, green, and blue-violet lights, corresponds to the white paper which may form the basis of a permanent colour-print heliochrome. When we insert the positive of the red sensation in its place in the lantern, its shadows cut off the red light, leaving the disk still white except in the shadows, where there remains only a mixture of the other two lights, green and blue violet; a transparent print from the same negative performs the same function when laid upon the white paper, provided that its shadows also cut off the rays that excite the fundamental red sensation, but freely transmit the green and blue-violet. I have found that a coal-tar dye, sold as 'thio blue A,' absorbs those rays which excite the fundamental red sensation, but freely transmit the green and blue-violet; a Woodburytype process print in this colour fulfils the requirement for a permanent print to represent (by transparency) the effect upon the fundamental red sensation. By a similar process, I have found that fuchsine fulfils the requirement for making a print to represent the green sensation, and aniline-yellow the print for the blue-violet sensation. It is true, as I have already pointed out, that these permanent colour-print heliochromes will show a slight degradation of colour in ordinary white light, but they should exactly reproduce the natural colours when viewed in a white light produced by mixing the red, green, and blue-violet spectrum rays.

"The theoretical conditions of success have, therefore, been realised for the negative process, and for all three methods of synthesis.

"But there is another aspect of this subject which, from a practical and commercial point of view, is quite as important as that of realising the theoretical conditions of success. I am of the opinion that, however perfect results this process could be made to give, it would not be reasonable to expect it to be commercially successful, so long as complicated by the necessity for making three separate photographic negatives and three separate photographic colour-prints, in order to obtain a single reproduction in colours. Such a complicated procedure might be carried out successfully by experts, dealing with such subjects as paintings or similar art objects, but would not be available for landscape photography, or in the hands of amateurs.

"The only way to make the process simple and reliable enough to be available generally, is to reduce the number of negatives to one, and dispense with the colour print process altogether. This I have accomplished, by the invention of a camera that makes the three pictures on a single plate, by one exposure from one point of view, and a device which I have named the heliochromoscope, that optically recombines the triple black and white photograph into a single photograph reproducing the natural colours. With this camera (about the size of a Kodak) and the heliochromoscope (the size of a hand stereoscope), the reproduction of the natural colour by photography is not only made practically available, but reduced to the simplicity of stereoscopic photography.

"I wonder if people are prepared to realise the full significance of this fact. The hope of producing colour *prints*, by a direct process, is calculated to discredit the value of an equally simple method that accomplishes substantially the same result in a different way. I said 'substantially the same result,' but, in a way, it is a better result, because it is quite impossible that any coloured picture, with its distracting surroundings and surface reflections, should ever produce such a perfect illusion of nature itself as we may obtain with this little instrument, consisting of several small mirrors, two of them transparent, placed at certain angles with reference to the photograph, and enclosed in a box. If the heliochromoscope was merely a box for seeing photographs in colours, it might be regarded with indifference; but I hold that it is as far from being merely that, as the phonograph is from being merely a device for making a noise by turning a handle. It is capable of accomplishing for us, in the reproduction of colours, more than the phonograph accomplishes for us, in the reproduction of sounds, because the illusion is more perfect. I quite believe that the writer who, in a recent article in *The Speaker*, described the heliochromoscope as a toy, comparable to the kaleidoscope, would have been capable, under similar circumstances, of comparing the phonograph to a baby's tin rattle.

"I have also tried to simplify and perfect the colour-print process. The employment of the new triple camera, making one operation take the place of three, is one step in that direction. The use of the dyes I have mentioned, corresponding to the colours produced in screen demonstration, is another. The production of a single print instead of three, cutting the images apart only when ready to be dyed, is another. Experiment with the Woodburytype process is another. The Woodburytype process offers the vitally important advantage for reproduction in large numbers that, having found, experimentally, the right amount of dye required in each of the three colour-prints, an indefinite number can be made without any variation; it will be available for the commercial production of lantern slides. These appear to be real advances: but, after all, the further complication and mechanical difficulties of carrying out the print-making process render it comparatively unsatisfactory up to the present time—and the value of composite heliochromy must be estimated, for the present, on the basis of its application to the photographic reproduction of the natural colours by optical superposition.

"If the heliochromoscope is the only solution of the problem that is sufficiently simple to be practicable for general introduction, there is, nevertheless, a field for the application of the method of colour projection for lecture illustration. Here, also, we escape the complication and mechanical difficulties of colour printing, and obtain results which are permanent as far as the colour record goes, and which can be shown to many people at one time. It will be necessary, however, to employ the arc electric light in order to project landscape views at night as perfectly as they have already been projected by sunlight. The value of the method cannot be fully demonstrated with the limelight.

"In conclusion, I would like to say another word to emphasise the fact, which I think is quite sufficiently demonstrated in the heliochromoscope, that although we are not able to make photographs in natural colours of exactly the kind that people have been looking for, we have, nevertheless, found a true solution of the problem of reproducing the natural colours by photography, as remarkable in its results as the telephone or phonograph, more perfect in the illusion of nature than would be possible in coloured pictures, and almost as easy to realise as stereoscopic photography. It seems to me that this is an advance so great that it should finally break down the prejudice against the idea of composite heliochromy which has grown out of the long series of failures of unscientific, complicated, and impractical methods. With no more operations than are required to make an ordinary photograph, we now make a photograph that, as we are able to see it, reproduces nature itself—light, shade, and colour."

The Annual Conference of the Camera Club was held in the Theatre of the Society of Arts, John Street, Adelphi, on the 22nd and 23rd March last. Captain Abney (the President of the Club, in the chair), in his opening address, gave a brief review of the advances made in the higher branches of photography, and referred to Lippmann's work, Eder's photo-dynamical theory, Professor Boy's application of shadow photography, astro-spectroscopic work, and concluded by an appeal for a Photographic Institute, in the following words :—

> "Turning to a totally different aspect of photography, we come to the means that should be adopted to give instruction in its various branches. We have a Government School at Chatham, of which I am proud to say I was the first head, and in it most branches of photography are taught with the best effect. But what we want is an institution which shall be open to all; where there are competent instructors in every branch, and from which a student can issue with a certificate of competency. This subject has occupied the minds of many, amongst others the members of the Camera Club, who, I am glad to think, are always willing to put themselves in the forefront of progress as far as photography is concerned. A Photographic Institute is required, we are told, and I believe it is becoming as necessary as other kindred institutions. But ways and means are the difficulty. Let us somehow or another endeavour to start such a one in a modest way, and not aim too

high at first. A modest building, a modest equipment, and last, not least, modest instructors, will soon show the public that the Institute is worthy of support."

Mr. Leon Warnerke drew attention to the method of Chemigraphic Etching, advocated by Geymet, which consists of causing the deposition of a metal on zinc, and placing the same in sulphuric, hydrochloric, or organic acid, when the same attacks the zinc at the place of deposition, whilst if nitric acid be used, the uncovered parts of the zinc were affected.

Mr. Warnerke then detailed his experiments with aluminium, and suggested the application of this photo-etching process for the preparation of ornaments which would withstand the action of the air far better than silver.

Mr. W. Willis demonstrated the improvement in his platinotype process, by which prints could be obtained with solutions at 50° to 70° F. with equally as good if not better results than with the previous methods. Practical experience of the last three months has confirmed Mr. Willis' statements, the range of gradation being lengthened considerably.

Mr. Andrew Pringle then gave a demonstration and address of "Photography applied to Medical Research," illustrating his remarks with lantern slides.

Mr. H. Van der Weyde gave a brief historical note and demonstration of his method of utilising the electric light for portraiture; and Mr. E. J. Humphrey demonstrated the application of his new oxymagnesium lamp for printing and lighting, in which "common gas charged with magnesium powder is blown through a ring-shaped burner, so as to give a hollow flame of cylindrical shape, in contact inside and outside with oxygen gas forming a modification of the blow-through jet." Fully exposed prints were obtained by means of this lamp with the expenditure of 30 grains of magnesium powder burning $4\frac{1}{2}$ seconds.

Professor Armstrong gave some well-thought-out notes on "The Theory of Development in relation to the Essential Electrolytic Character of the Phenomena and the Nature of the Photographic Image," which unfortunately will not allow of useful condensation.

The second day of the Conference was opened by Mr. James B. Spurge by a paper on "Pressure Gauges," which suggests the use of glycerine, an almost incompressible fluid; and from tests made with explosions of 600 atmospheres' pressure the gauges were not burst. Mr. Spurge also described an improvement in the sensitometer which bears his name, and of the method of using it.

Mr. H. P. Robinson contributed a paper on "Paradoxes of Art, Science, and Photography," which contains some bold and original ideas, and was practically an impeachment of art and science.

Mr. Hugh Stannus' "Notes on the Uses of Photography to the Decorative Artist," and Mr. Henry Blackburn's paper on "The Debt of Art to Photography" were both valuable and suggestive, the former especially.

Mr. C. H. Bothamley then read the concluding paper, "On some Points relating to Developments," which treated in the usual style of this writer of Hurter and Driffield's experiments, which were considered Not Proven, and the possibility of altering by development the gradation of positive prints by development on bromide paper.

The usual dinner to the members and friends of the Camera Club closed the proceedings.